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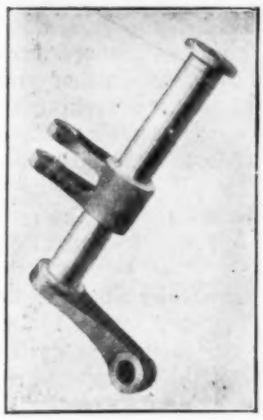


Converting A Machine Shop to Emergency Production

By L

Ellsworth Sheldon
Associate Editor, American Machinist

Until the United States entered the war in April, 1917, the country's mechanical resources were rather a subject for conjecture than a matter of statistics. No one knew and few dared to predict the extent of the flood of productive energy that was to be let loose when the absolute necessity for it was disclosed. Concerns that had been loafing comfortably along under the false impression that their resources were strained to the limit, suddenly doubled and trebled their capacity, and that upon work for which, until they were in the midst of it, they did not know they were equipped to handle. The subjoined account tells how one shop met the crisis and, without stopping for preliminary fitting up, plunged into the job of converting machinery to new purposes and evolving new methods of handling unfamiliar work as it went along.

DURING the "great rush" when every shop capable of turning out war material of whatever nature at all suited to its equipment was working feverishly to the limit of its capacity, there were many instances where the native ingenuity of the proprietors or the workmen rendered possible the rapid and efficient production of work that, at first glance, seemed hopelessly alien to the line in which the shop was regularly engaged.

The Schickel Motor Co., of Stamford, Conn., was comfortably busy building motor-cycles for commerce and pleasure, when Uncle Sam was suddenly landed in the turmoil of war, and it became imperative that every shop—big and little—should give prime consideration to the making of something that would render material aid in resolving the sinister menace that threatened the world.

Designing the Tools and Fixtures

From the myriads of small parts that go into the making of various kinds of war material, Mr. Schickel who, incidentally, was his own tool designer, and who later devised all of the tools, jigs and fixtures described in this article, chose among other things the valve rocker-arm of the Liberty motor, shown at the head of the page, as a medium through which to contribute his share of the energy required to put the U. S. A. on a war basis. The reasons for this choice were many, but perhaps the chief consideration was the fact that the part was not so far removed from his regular line of manufacture as some others; and though the adaptation of a factory equipped for the manufacture of a comparatively small number of complete cycle motors to the production of thousands of one small part, involved the design and construction of many special tools as well as the conversion of much machinery to uses other than that for which it was originally intended, this could still be accomplished with less loss of time than would be required to put the factory in shape to manufacture something not so closely related to its original product.

Though the war service of this factory was by no means limited to the single part, the variety of tools and fixtures used in its manufacture and the ingenuity displayed in their conception and design have caused this one part to be singled out for illustration purposes.

The rocker-arms, operating both inlet and exhaust valves of the motor, were of two kinds, designated in the shop as "rights" and "lefts" as a matter of convenience.

They could not be called inlet and exhaust for the reason that a "right" might be operating an inlet valve on one block of cylinders or an exhaust valve on the other. The difference between a right and a left is mainly in the relative position of the cam roller-fork with respect to the length of the piece. There are, of course, one pair of these arms to each cylinder and as an extra pair was sent out with each motor, a Liberty "twelve" required 26 pieces.

The pieces were drop-forged from chrome-nickel steel, were about 5 in. in length and weighed a little over a pound. The sequence of operations is shown in Fig. 1, beginning at the lower right-hand corner with the forging *A*, which is received at the factory in an annealed condition. A table showing the sequence of operations appears at the end of this article.

Many of the forgings were bent, due, no doubt, to

careless handling in annealing, and the first attention they received after checking in, was to gage them as shown in Fig. 2 and, if necessary, to bend them so that they will clean up in subsequent operations. The bending is done as in Fig. 3 by holding them in a vise and using a piece of pipe to make the arms conform to the gage.

The first machine operation is shown in Fig. 4, and it is performed in a Lincoln type milling machine with a built-up gang of cutters. This machine faces the parts to exact length except for the minute allowance for polishing, besides opening the cam-roller-fork and removing surplus metal from the sides of the latter. A small flat, *b* and *b*, Fig. 1, is milled on the boss at each end of the piece, and these flat spots become the locating points for the next operation.

To insure the constant delivery of equal numbers of right- and left-hand parts, many of the tools were arranged to handle the work in pairs, or multiples of pairs. When this was not practicable, machines were operated in pairs, one producing "rights" and the other "lefts."

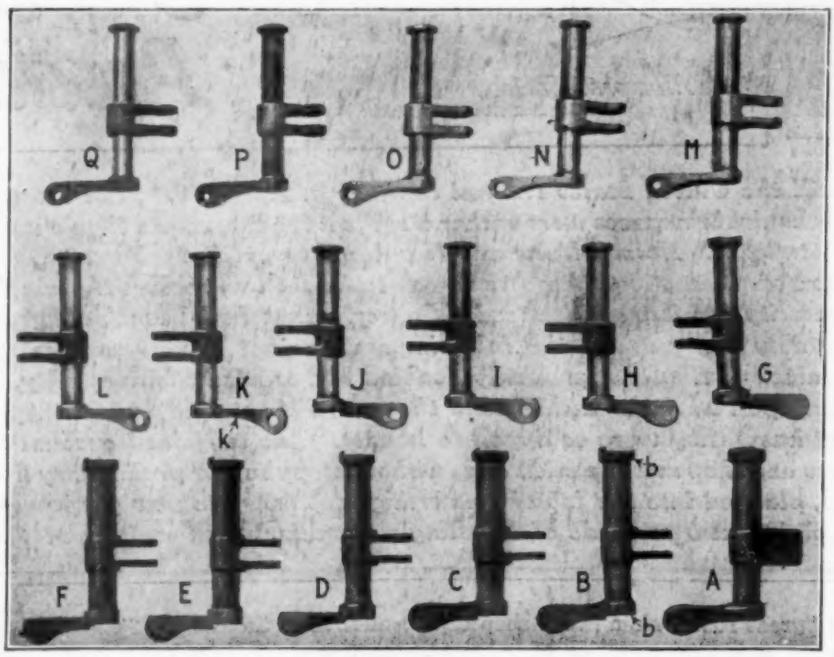


FIG. 1. SEQUENCE OF OPERATIONS

The holding fixtures are, as far as possible, made on the reciprocating principle; that is, one half of the fixture may be unloaded and reloaded while the cut is going forward on the group of parts held in the other half. This is partly accomplished in the fixture shown in Figs. 4, 5 and 6. It is obvious that to secure proper results, the machine table should always be fed against the action of the cutters—in this case from left to right (see Fig. 6). As soon as the table is run back to its extreme left position at the end of a cut, the right end of the fixture, which will at that time be empty, is loaded and the cut started. While the cutters are occupied on the first four forgings, the operator is removing the milled parts, cleaning the fixture and reloading the left end. As the cutters approach the extreme left end, the right end is unloaded and cleaned preparatory to reloading as soon as the table is run back.

Fig. 5 shows the fixture empty and from it one may observe the principle upon which it is constructed. A base casting *A* is bored to receive two rods (the end of one showing at *B*) which pass clear through it and are clamped in by the draw bolts and their nuts *C*. The jaws *D* are fitted to slide on the bars, being left somewhat loose so that they can in a measure adjust themselves to slight irregularities in the forgings. A forging is put in place between each jaw and the one immediately before it, the following jaw in each case having a 90-deg. angle V-groove across its face to assist in locating the work. The tappet arms rest against the pins *E* to prevent a partial rotation of the work under pressure of the cut. As the pressure of the setscrews *F* is transmitted through each piece and each movable jaw to the central buttress of the main casting *A*, all the parts are held with equal firmness.

Fig. 6 shows one of the machines with the fixture loaded. The pieces to the left have been finished and are ready to take out while the cutters are working on the others. This picture shows also the profile and other gages to which the pieces must conform after this operation.

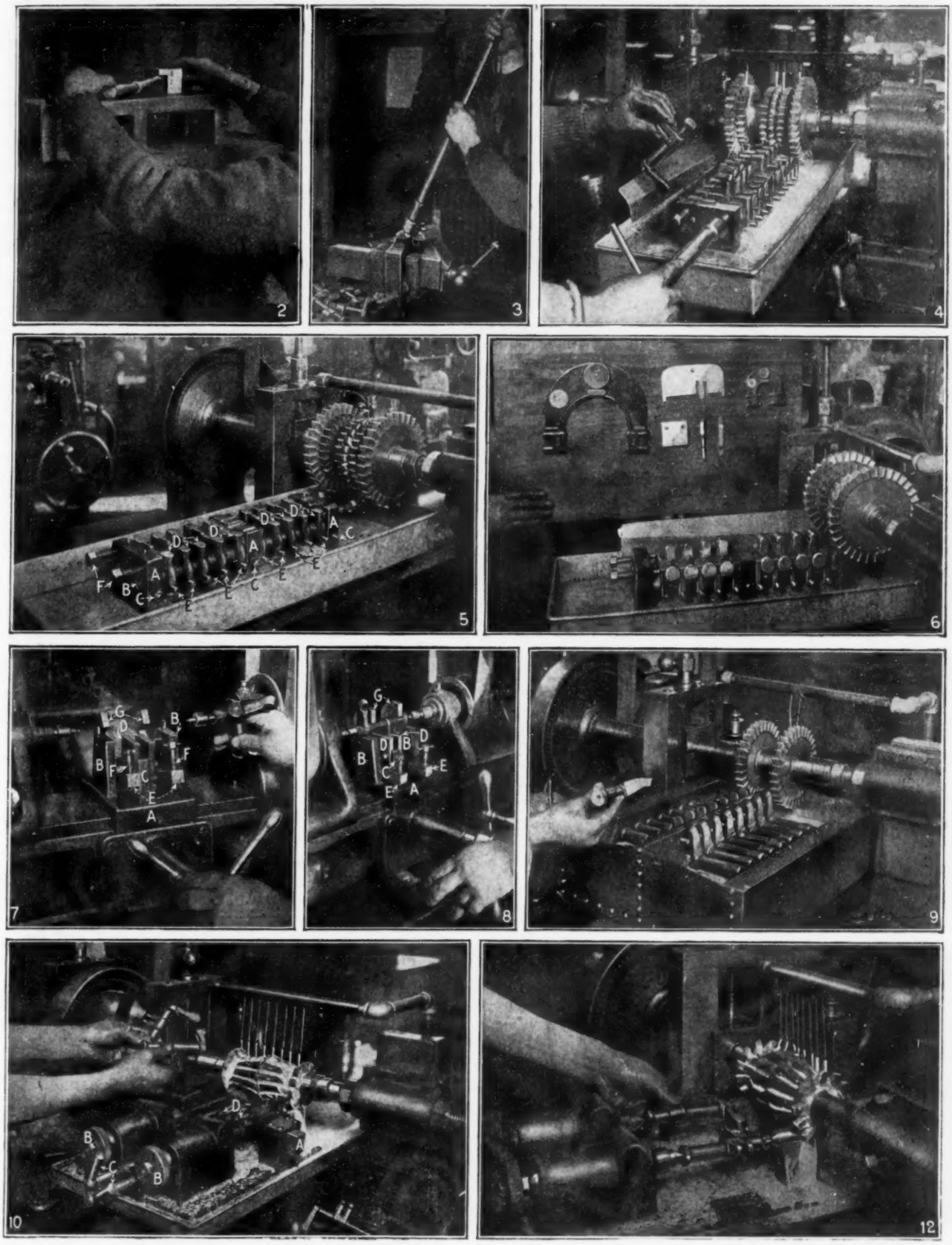
From the milling operation the parts go to the centering machine shown in Figs. 7 and 8. This operation must be very carefully done as by the method followed, the center at the tappet-arm end constitutes the locating point in subsequent operations having to do with the position of the cam-roller-fork and the journals. The depth of the center is held within limits of 0.001 inch.

In this operation the right and left feature receives no consideration, the fixture having two gaging points so placed that the piece automatically selects the one intended for it, so that mixed parts can, if desired, be handled as readily as if previously sorted. A casting *A*, Figs. 7 and 8, having two uprights *B* is gibbed to the bed of the centering machine and when adjusted for position is clamped by means of the gib screws.

The tops of the uprights are planed off to the proper height to support a forging while it is being centered. A shorter boss *C* in the center furnishes a support for the gaging pieces *D* which position the work endwise, and a pin in the top of each upright holds it to center transversely. The forgings rest upon the uprights *B* at the points that were flattened off for that purpose in the first milling operation. Two levers *E*, fulcrumed about midway of their length, have at their front ends the tightening screws *F* bearing upon the base casting, while at the back end the hook-shaped pieces *G* are pivoted in such a way that as the hooks are drawn down by tightening the screws *F*, they are also drawn backward, holding the work against the locating pins. The centering drills are fed forward by hand.

Located From Previously Finished Points

From this point onward the work is handled either on centers, or in jigs or fixtures, the locating points of which bear upon surfaces that are finished on centers. The set-up for milling the inside of the tappet arm is shown in Fig. 9. The fixture is a heavy casting that resembles a square box with a partition through



FIGS. 2 TO 12. SOME OF THE MILLING OPERATIONS ON THE ROCKER ARM, SHOWING THE TYPE OF FIXTURES USED

Fig. 2—Gaging to discover bent forgings. Fig. 3—Straightening bent forgings. Fig. 4—Milling ends, opening and dressing cam-roller-fork and spotting for centering machine. Fig. 5—The milling fixture before loading. Fig. 6—The milling fixture with work in place. Fig. 7—The centering machine. Fig. 8—The centering machine. Fig. 9—Milling inside of tappet arm. Fig. 10—Form-milling top of tappet arm. Fig. 12—Form-milling bottom of tappet arm.

the middle. The ends of this box, however, are merely sheet-metal pieces fastened with small screws and their function is to keep the cutting compound from slopping about on the operator or the floor.

In the central wall of the jig are eight fixed centers with points on both ends. Opposite to these points in each outside wall of the fixture are the corresponding centers which are threaded into the casting and may be advanced by means of a special wrench fitting a socket in the end of each screw. Studs passing through the central wall at the proper place support the tappet arms and take the thrust of the cutters as the inside surface of the tappet arm is milled off. Eight pairs of rockers are operated upon at once with a pair of straddle-mills.

The next operation is to form-mill the top of the tappet arm and is shown in Fig. 10. The work is again located upon centers and is handled in pairs, but as the surface finished is so short in relation to the length of the piece, only one pair is handled at a time.

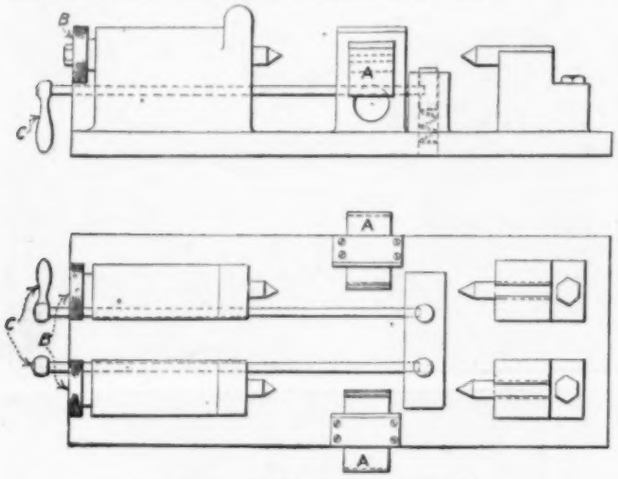


FIG. 11. DIAGRAM OF FIXTURE

A slide *A* at each side of the fixture has a V-groove upon its inner end, and is moved forward by a collar-headed screw below it. This slide bears upon the round end of the cam-roller-fork and brings it to a definite position after the piece has been placed on centers. The tail centers are moved up by the knurled wheels *B*.

A Spring-Adjusted Support

A pair of ingeniously contrived spring plungers located within a boss upon the base casting of the fixture furnish the supports upon which the tappet arm rests while being milled. The slides *A* as before stated bring the pieces to the right position relative to the axis of rotation after the centers are tightened. The spring plunger under the tappet arm resists any such movement, but the tension of the spring is overcome by the action of the slides.

It will be observed that the end of the tappet arm is now supported merely by spring pressure, and to make this foundation solid enough to prevent the springing of the work while under the cut, large screws bearing upon the spring plungers are tightened by means of long extension rods passing lengthwise through the fixture and operated by the handles *C* at the rear. A backstop is provided by the screws *D* which are set up by hand after the pieces are positioned.

Fig. 11 is a line drawing showing the details of this fixture, in which the parts are lettered as in the previous illustration. Fig. 12 shows the operation on the opposite or bottom side of the tappet arm. The fixture used is cast from the same pattern as the previous one, but the locating slides and floating stops are not necessary as the work is now located from an already finished surface.

The lathe work begins at this point with the operation shown in Fig. 13. The pieces are rough-turned in an engine lathe, to remove the scale and dig out the corners that would prove too destructive to the forming tools used in later operations. No size is maintained except to be certain that the work is not made too small to finish. Fig. 13 shows an ordinary high-speed toolbit in use, but a welded stellite tool was later substituted which proved to be longer lived and capable of getting off the stock faster.

A forming operation follows in a Gridley automatic screw machine which reduces the piece to grinding size. The work is placed on centers by hand and the tools fed straight toward the center, cutting a chip the width of which is the length of the journal. Fig. 14 shows the Gridley machine set up for this work. A National-Acme machine was also fitted up to perform the same operation, one machine handling "rights" and the other "lefts."

Figs. 15 and 16 show front and rear views respectively of the set-up in the latter machine. The rear slide has no movement in this set-up, serving only to support a special spider which is fitted with a small lever-operated tail spindle opposite each of the live spindles. The work is all done in the two lower positions of the spindles, leaving the upper positions free for the operator to take out finished pieces and set in others to be operated upon.

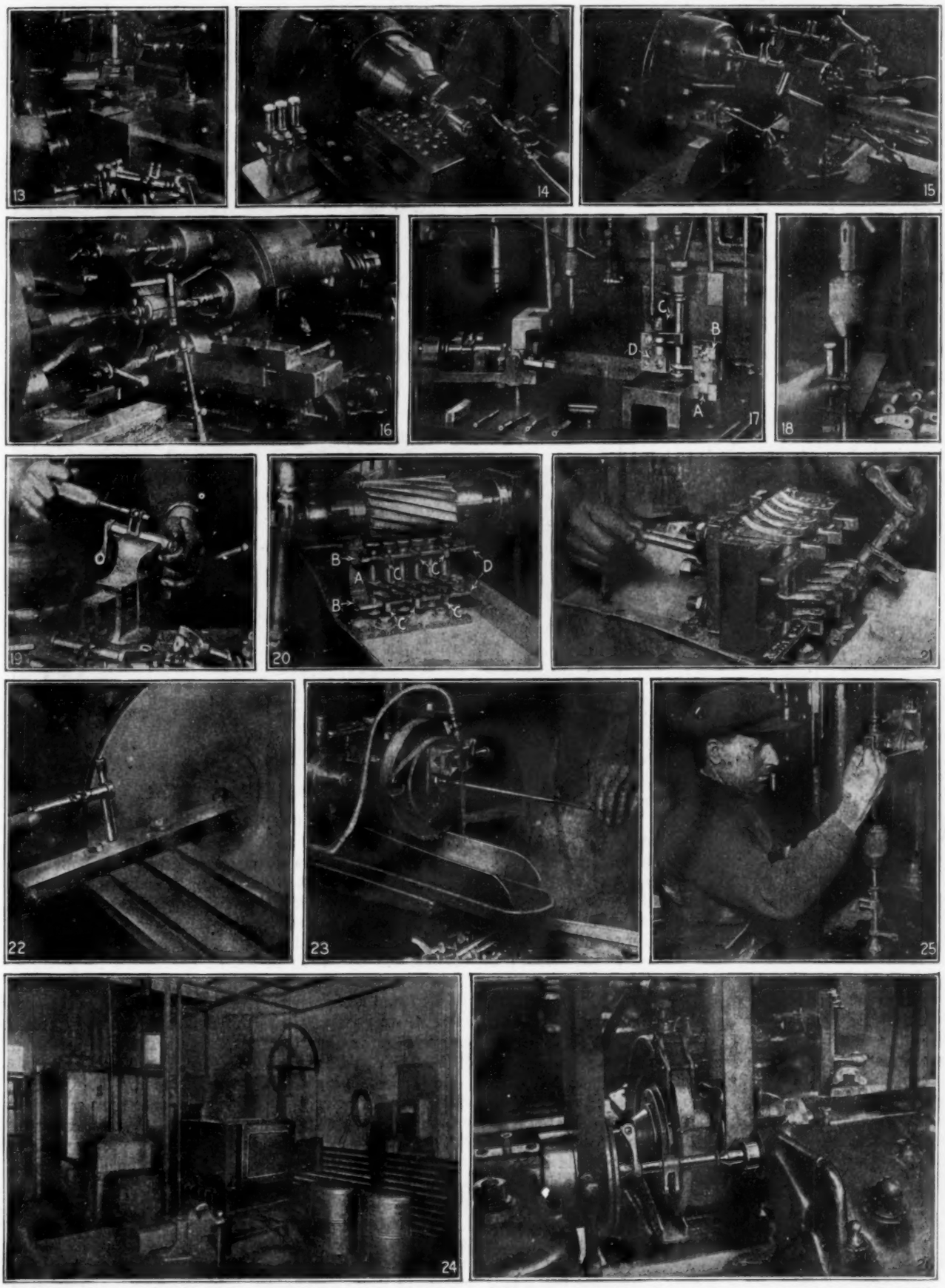
Alternating the Fixtures to Keep Production in Pairs

It was necessary to drill, ream and countersink a hole in both sides of the cam-roller-fork, and to drill and counterbore for broaching the hole in the end of the tappet arm. The jigs shown in Fig. 17 provide for all of these operations, separate jigs being necessary for the right- and the left-hand pieces. In these jigs the work is held upon centers and located for position by the end of the tappet arm.

A latch, shown at *A*, swings over this arm after the work is in place and is clamped by a wing nut and swinging bolt pivoted in the fork *B*. The jig is made to stand in two positions and the work is done in a four-spindle Henry & Wright drilling machine. The tools are guided by the bushing in the fixed bracket *C* and by the adjustable bracket *D*.

It was necessary in setting the pieces on centers to adjust both centers each time, for the work was located endwise by the gaging bracket *D* in the cam-roller-fork; the distance from this fork to the hole in the tappet arm being an important dimension. The first operator loads a jig, drills and reams the holes in the cam-roller-fork, then pushes the jig and contained piece over to the other operator, receiving in return the other jig which the second operator has unloaded. The second operator drills and counterbores the hole in the tappet arm, unloads the jig and exchanges it for the other one with which the first operator is just finishing. Thus, in this operation the work goes forward in pairs.

The operation of countersinking the hole in the cam-roller-fork is quite simple; the piece is held by hand, resting upon a parallel clamped to the edge of the table of a sensitive drilling machine as shown in Fig. 18.



FIGS. 13 TO 26. FURTHER OPERATIONS, SHOWING FIXTURES FOR TURNING, DRILLING AND MILLING, AND THE TEMPERING AND GRINDING OPERATIONS

Fig. 13—Rough-turning. Fig. 14—Automatic finish-turning in Gridley machine. Fig. 15—Automatic finish-turning in National-Acme machine. Fig. 16—Another view of the National-Acme machine. Fig. 17—Drilling and counterboring the holes. Fig. 18—Countersinking. Fig. 19—Hand-reaming. Fig. 20—Milling outside of tappet arm. Fig. 21—Fixture for holding work in operation 11. Fig. 22—Hand-grinding on abrasive disk machine. Fig. 23—Broaching the hole in the tappet arm. Fig. 24—Heat-treating furnace and oven. Fig. 25—Cleaning centers after heat-treating. Fig. 26—The final grinding operation.

This is followed by a hand-reaming operation, Fig. 19. The sequence of this latter operation was later changed as shown by the operation sheet.

A milling operation is shown in Fig. 20 in which the pieces are supported from the turned surfaces. The operation consists of milling the outside contour of the tappet arm as shown at *k* in Fig. 1.

The fixture is an angle-plate casting *A*, upon one face of which two hardened-steel strips *B* are fastened, each having six V-grooves so placed that they form the equivalent of six pairs of V-blocks set to hold round pieces in a vertical position. Three pairs of studs *C* are fitted to slide freely through holes in the casting and are each threaded on one end for a nut, while near the end that projects from the working face of the jig there is in each stud a rectangular hole to take a $\frac{3}{4}$ x $\frac{3}{16}$-in. hardened steel parallel strip *D*.

Six rocker-arms are set in the V-block with the already finished inner face of the tappet arm resting on the planed top of the casting, the parallel pieces are slipped through the rectangular holes in the studs and the latter drawn up by their respective nuts. Thus, while the parts are held tightly in the V-blocks, the pressure of the cut is supported by the top of the main casting and the tappet arms are positioned by studs which are so arranged as to locate properly either right- or left-hand parts, so that it is possible to mill six pieces of one hand or three pairs at one time.

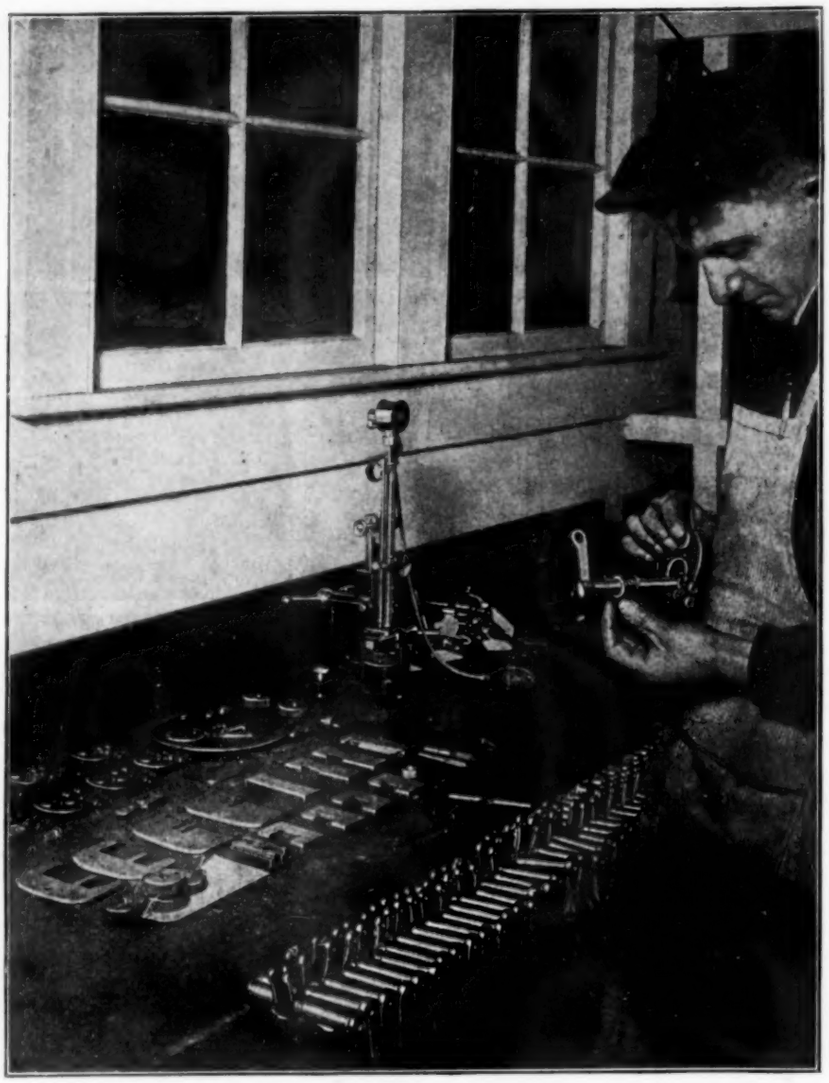


FIG. 27. A CORNER OF THE INSPECTION DEPARTMENT

Fig. 21 shows very plainly the construction of the fixture and also the work to be done. The cutter is an ordinary plain milling cutter with helical flutes, the requisites being that it must be held closely to diameter, only one or two grindings being allowed before substituting a new cutter, and it must be stopped at the right place, upon both of which points the contour of the tappet arm depends.

The outer end of the tappet arm must be finished to a true radius running imperceptibly into the contour of the top and bottom surfaces of the arm, which it will be remembered are finished by the milling operations shown in Figs. 10 and 12 respectively. These two cuts leave a rather awkward place to be finished as the contour to be covered is rather more than a half circle and consequently could not be milled with a concave-faced cutter. Further, any method of milling would have to be very carefully supervised in order to avoid a shoulder at the points of tangency.

A Simple Fixture

Fig. 22 shows how the work was done, the only equipment necessary besides the grinding machine being any piece of iron big enough to strap onto the table of a disk grinding machine, a properly located stud in the piece, and a plug fitting the hole in the tappet arm and also fitting a hole in the end of the stud. The table of the grinding machine, to which the device is bolted, is swung across the face of the disk while the work is turned by hand, back and forth, around the plug. One pass across the face of the disk is sufficient.

The hole through the tappet arm requires a somewhat complicated operation or set of operations to produce. This hole is first made as described and illustrated in Fig. 17 and accompanying text, by drilling a small hole clear through and then counterboring this hole to a larger size for about half its depth. The hole is shown in Fig. 1 from *I* forward. The broaching occurs at *N*.

In the broaching operation shown in Fig. 23, the final shape of the hole is made by a broach, the section of which is a circle with two flat sides. The diameter of the circular section is the same as that of the larger hole in the arm so that, when broached, the hole appears to be of uniform diameter clear through but with the lower part filled in on two sides.

The fixture for holding the pieces consists of a pair of V-blocks attached to a bolster plate, through the center of which is a hardened-steel bushing. The work rests in the Vs, being held thereto by swinging clamps, while the under surface of the tappet arm rests upon the head of the central bushing. This fixture handles either right or left parts, either part being located endwise by the broach itself.

Fig. 24 shows a part of the equipment for heat-treating, both furnace and oven being gas fired and equipped with electric pyrometers for determining the heat. The furnace in the foreground was installed especially for this work, but the large oven graduated from the job of baking enamel on motor-cycle parts. While not ideal in the matter of gas consumption, it had the advantage of being already on the job and as its work consisted of drawing the hardened parts to about 675 deg. F., it served the purpose admirably.

OPERATION SHEET FOR LIBERTY MOTOR PARTS, NOS. 8019 AND 8020

1. Straighten.
2. Milling.
   Gang of seven cutters. Mill ends; mill sides of cam-roller-fork; open slot in cam-roller-fork; spot for centering. Right hand on one machine, left hand on the other.
3. Centering.
   Depth of centers must be held to limit of variation of 0.001 inch.
4. Milling.
   Two cutters, mill inside of tappet arm. Run in pairs.
5. Milling.
   Two special formed cutters. Mill top of tappet arm. Run in pairs.
6. Milling.
   Two special formed cutters. Mill bottom of tappet arm. Run in pairs.
7. Rough-turn.
   Pieces handled separately in engine lathe.
8. Form-turn to grinding size.
   Rights in Gridley automatic; lefts on National-Acme.
9. Drill, ream and counterbore.
   Separate jigs for right and left. Operations go forward in pairs.
10. Countersink holes in cam-roller-fork.
    Pieces handled separately.
11. Milling radius on side of tappet arm; one plain milling cutter. (Do not allow this cutter to become under size.) Run in pairs.
12. Hand-grind contour of end of tappet arm.
    Operation performed individually on disk grinding machine.
13. Rough-polish.
    Hand operation.
14. Broaching.
    Broach hole in tappet arm. Handle right and left consecutively.
15. Reaming.
    Hand-ream hole in cam-roller-fork.
16. Heat-treating.
17. Lapping centers.
18. Finish-grinding.
    Rights on one machine; left on the other.

One feature of the work that is to be finish-ground on centers that cannot receive too much attention, is the cleaning and truing of the centers after hardening. If these are not round, or if they carry particles of grit, it is futile to expect the work to be round after grinding. For this reason the centers in the work under consideration are very carefully lapped and cleaned, the work being done in a sensitive drilling machine with formed metal laps charged with diamond dust. A helper with a pan of gasoline gives the centers a thorough rinsing and wipes them out with a piece of waste several times during the lapping process.

The pieces are ground in two separate operations upon Landis grinding machines as shown in Fig. 26, after which they are ready for the final inspection. A corner of the inspection department is shown in Fig. 27 where the work is tested not only for size and form but for hardness.

Rules of Etiquette for Foremen

BY CHARLES D. FOLSOM, JR.

I have had some hearty laughs over the articles on pages 756 and 1026, Vol. 51, by Jack Homewood on "Rules of Etiquette To Be Observed in the Machine Shop." There is truth in those articles, and they were obviously drawn from real life. It seems to me, however, they are a little bit one-sided. I have seen all the antics so cleverly described by Mr. Homewood, and more too, during the "late unpleasantness"; but I have seen something else, both before and after. I refer to the actions of foremen and others in charge of machine shops, and so I should like to propose a few "Rules of Etiquette To Be Observed by Machine Shop Foremen."

When Hiring a Man: Maintain your dignity. Don't let the applicant think you're a human being, because then he will try to take advantage of you. Cover him with a cold and searching glare as though you suspected him of being an escaped convict. This puts him in a genial, confiding mood. Then begin to fire questions. "Where did you work last?" "Why did you leave there?" "Where did you work before that?" "How long did you work in each place?" "How much did they pay you?" "Where did you work before that?" "And before that?" "And before that?" * * * "Can you read a blueprint?" "Do you know how many thousandths there are in an inch?" These time-tried questions are especially recommended. When asked at the rate of twenty-seven or more per minute, the man becomes too frightened to lie and consequently tells the truth, the whole truth, and * * * and then some.

When Breaking in the Man You Have Just Hired: Lead him over to the rickety lathe that the regular men steer shy of, give him a job on which he can prove his ability (or otherwise) and then walk quickly away. Don't go far, however; he might put the lathe in his pocket and make a quick getaway. Hence you should select a point of vantage and spend the morning there, watching him with fatherly care. This is important, because when he realizes the benevolent interest you are taking in him, his ruffled nerves are quieted and he feels at his best.

When You Feel It To Be the Part of Wisdom to Grant the New Man's Demand for a Raise: First sequestrate the happy man where no prying ears may hear the glad tidings. Then with a Santa Claus smile break the news, adding "of course you understand this is not to be mentioned to anybody." "Oh, no!" is the response; at which you are greatly pleased, because you now know that the secret will be well kept—by everybody in the shop.

When a Rush of Work Forces You to Take on a Number of New Men in a Hurry: Don't be finicky. Take what you can get and pay them what they demand. You

should worry; you won't keep them long. Only be sure to impress upon them that their wages are their own business, and not to be discussed with the other men. This makes for a hearty feeling of co-operation and good-fellowship in your shop, especially when one of your "old-timers" finds that a green war-mechanic is getting ten cents an hour more than he.

When the Slump Comes and You Begin to Lay Off Men: Don't let any inkling of the impending cataclysm find its way into the gossip of the shop; it might tend to break down the morale which you have so carefully nurtured. Figure things out to a nicety, and just when the last day's work is going through, spring the news at about 3:30 in the afternoon. Don't make the childish mistake of letting them know beforehand; they probably wouldn't do it for you.

This is my set of rules for the machine shop, and I should like to see it framed and hung over the desk of some foremen I have known. But, speaking seriously, is there not a good deal to be said on both sides, both of criticism and defense? I think that the subject might profitably be discussed by the readers of *American Machinist* in a serious as well as a frivolous vein. Here are a few suggestive questions, which I for one would like to see answered:

What is the practice of the "best shops" in laying men off? Do they give any advance pay? Do they give any notice? And in the latter case, do the employees show themselves worthy of the courtesy?

Is the principle of secrecy in granting increases of wages ethical and expedient?

Should any weight be attached to data given by an applicant for a position relative to his previous employers, wages, experience, etc., until it has been investigated?

Is it cheaper to look up a man's record or to try him out in the shop?

Reboring Motor Cylinders

By E. C. Jones

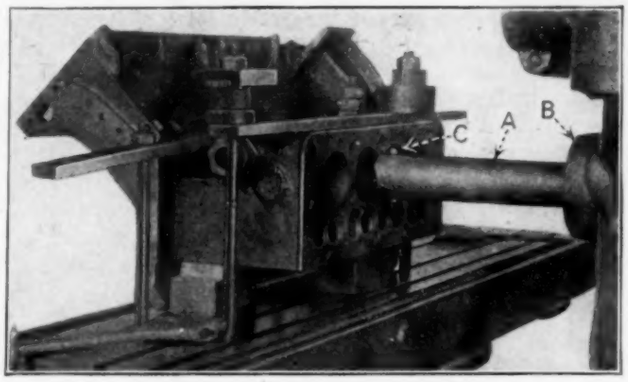
The writer was recently confronted with the fact that the cylinders of his pleasure car were so badly worn out of "round" that it was necessary to have them rebored true.

The only available machine at hand for doing the work with the degree of accuracy required was a 3A Brown & Sharpe milling machine.

The boring bar *A* was made to fit the usual tapered hole in the spindle of the machine, but in addition had a collar turned just in front of the taper shank and integral with it. A cap nut *B* was made to fit closely over the bar and was threaded on the inside to fit the nose of the milling-machine spindle.

The purpose of the slip collar was to press against the collar on the boring bar, causing the bar to be firmly driven home and holding it in place.

The cutting tool used was a single tool inserted into a hole drilled near the end of the boring bar and held in place by means of a setscrew. The tool differed from the usual boring tool in that it was in the form of a wide round-nose tool with a V-shaped cleft made in the cutting edge, thus forming a tool with cutting edges. The forward or front cutting edge of the tool was made about $\frac{1}{16}$ in. wide while the rear edge was $\frac{1}{4}$ in. wide and ground to cut somewhat deeper than the front cutting edge. A back clearance of about 20 deg. was ground on



THE CYLINDER BLOCK MOUNTED FOR REBORING

the tool and 0.010 in. of metal was removed from the cylinder walls in two cuts.

The slowest feed of the milling machine was used. As the work was fed toward the tool in the bar, the cut taken on the cylinder wall described a spiral path, and the rear cutting edge of the tool was made sufficiently wide to enable it to cut the crown of the thread-line surface left by the front cutting edge of the tool.

The bores of the cylinders were finished very smooth and showed little trace of chatter marks.

The Mechanics of the Future

By Thos. W. R. McCabe

On page 70 of the *American Machinist* there was published an article by Joseph T. Taudvin under the above title.

Mr. Taudvin is no doubt correct as to many industrial employers placing men with technical education as superintendents, general foremen, and in various positions of trust, in preference to one of acknowledged skill and experience. The writer has seen many men of this type so placed, and later replaced by the latter class of men, owing to the lack of ability of the former class to instruct and direct those over whom they were placed. I am of the opinion that, at the present time, many industries are prosperous owing to prices and demand for almost all lines of manufactured articles. Managements which in normal times would bankrupt the concerns of which they are the heads are now acclaimed great and wonderful successes. Many hold their present positions owing to their free use of the English language and high-sounding phrases. During the war new high-sounding terms were coined for all kinds of jobs. Jobs are no longer jobs but positions. Skilled men are discredited and called poor workmen because their foremen are unable to judge owing to their own lack of knowledge.

While it is well for all young men to obtain as good an education as possible I am of the opinion that the young man who is now working and gaining that practical experience which is so essential before intelligently directing others, will finally be the man at the top of our industries regardless of his lack of technical knowledge. Technical education is a help though as some advertisements say it is not essential.

Zinc (in the form of zinken) was first used by Paracelsus. In medieval days zinc and bismuth were confused and the word spiauter, the modern spelter, was indiscriminately given to both.

Educating an Entire Personnel

By MARK H. REASONER
Works Manager, Diamond Chain and Manufacturing Co.

The educational plan described here is unusual in its comprehensiveness, reaching from the lowest-paid employee up to the general manager, and giving to each a course of study and training best suited to increase his ability and prepare for a bigger job. It is encouraging to note the greatly decreased labor turn-over which was one of the byproducts of a scheme intended to make men think and to broaden their viewpoint.

UNTIL recently our country has done little or nothing of consequence to develop the personal efficiencies, knowledge and skill of its craftsmen. It spends millions of dollars annually on general education. It spends several thousands of dollars of public funds on any individual who can afford to devote a suitable length of time to attending a college and becoming a first-rate professional man or woman. It rarely, if ever, spent a single dollar to improve as a mechanic or better the condition of a workman until the war period and reconstruction conditions forced a change.

If every soldier were back on his job today the country would still be short millions of workers, owing to the lessened tide of immigration in former years. Workers are needed everywhere, and we must help by every means possible those now in our employ to do more and to gain through increased production a greater share in the profits.

What then of the waste of human effort and equipment by employing men and women at tasks which they little understand and at which they can only escape condemnation by a plea of carelessness or ignorance?

Formation of an Educational Plan

These facts faced the Diamond Chain and Manufacturing Co. in 1918 and caused the formation of an educational plan for training employees. The course outlined was organized in three sections: (1) For factory employees; (2) for foremen; (3) for executives. The courses for factory employees were taken up along vocational training lines. At the request of the company, the work was outlined as vocational and part time, and it was found that it could be legally paid for from the funds on hand derived from tax levy under the Indiana vocational education statutes. The school being duly authorized under the law, the company agreed to furnish facilities and equipment, the school board to furnish the teachers. The women employees from the factory, of all grades except those in the offices, were eligible for the first series of classes. They were paid straight time for all time consumed in class work. The course was divided into four parts or major lines: (1) Common branches and social science; (2) industrial processes, history of material and commercial geography; (3) domestic science, cooking and sewing; (4) first-aid work.

As fast as one class finished the eight weeks of instruction in each section, it automatically graduated into the next division until at least 32 weeks of time had been put in. Classes consisted of from 11 to 15 girls and the schedules for sections one and two were as shown in Table I.

TABLE I. SCHEDULE OF CLASS HOURS FOR WOMEN.

Class "F"	
8:00— 8:45	Arithmetic
8:45— 9:30	Social science
9:30—10:00	Hygiene
10:00—10:20	Physical exercises
Class "G"	
1:00— 1:45	Arithmetic
1:45— 2:30	Social science
2:30— 3:00	Hygiene
3:00— 3:20	Physical exercises
Class "F"	
10:00—10:45	Industrial processes
10:45—11:30	History of Material
11:30—12:00	Commercial Geography
Class "G"	
3:00— 3:45	Industrial processes
3:45— 4:30	History of material
4:30— 5:00	Commercial geography

Taking up the subjects individually, it was found that there was a considerable variance in the previous training and education of the personnel of the school and that many variations and shifts were necessary to bring the classes to a common level.

Form 169 D.C. & Mfg. Co.

CONTINUATION SCHOOL REPORT CARD

Date Name

Characteristics	Grade	Characteristics	Grade
Attitude		Sense of	
Cooperation		Organization	
Tractability		Promptness	
Common Sense		Executive Ability	
Tact		Results Obtained	
Energy and		Drawing	
Determination		Mathematics	
Initiative		English	
Attention to		Physics	
all Details		Civics	
Analytical Ability		Geography	

100 % Excellent 70 % Fair
90 % Good 65 % Poor
80 % Medium 60 % Unsatisfactory

Description of Action Taken

Made By

REPORT CARD FOR STUDENTS IN ALL CLASSES

When the cooking class was organized, it was found expedient to hold this twice per week at 3 p.m. on Wednesday and Thursday, and to have a six weeks' course instead of eight. The first class carried an enrollment of 28, which was found unwieldy, and subsequent classes were limited to 13 persons. The methods here employed were demonstrations and experiments, and the objects of the lessons were to teach the preparation of cheap and wholesome food with the least expenditure of time, energy and money. Six main points were emphasized: (1) Necessity of buying economically; (2) necessity of buying in advance of needs; (3) necessity of serving well-balanced meals; (4) necessity of using left-overs; (5) necessity of serving food attractively; (6) necessity of taking care of food immediately after the meal, and the care of the kitchen.

The method of conducting the class was a 15-min. lecture on the theory to be employed in the hour following, after which 15 min. were taken for testing and serving, followed by a 30-min. period of dish washing and cleaning up, making a 2-hr. period. Two housekeepers were appointed and these were changed each week. The first class consisted of 10 lessons; the subjects covered were as given in Table II.

TABLE II. FIRST COURSE IN GENERAL COOKERY.

I. Introductory.
- Necessity for food.
  - Building and repairing tissues.
  - Heat and energy.
- Necessity for cooking food.
  - To render it more palatable and digestible. To destroy germs of disease and other parasites.

II. Classification of Food Principles.
1. Water.
2. Mineral matter.
3. Carbohydrates—sugar—starch.
4. Fats and oils.
5. Proteids—Flesh formers and heat givers.
   Food adjuncts—alcohols—acids.

III. Water.

Food value.
1. Solvent power.
2. Heat regulator.
3. Aids chemical changes.
4. Carrier.
5. Keeps parts soft and pliable.

Water boils at 212° F. Freezes 32° F.

IV. Mineral matter.
1. Source.
2. Food value—aids chemical changes.

V. Starch.
1. Food value—heat given.
2. Digestive—stages in cooking of starch.

VI. Foods containing starch.
1. Vegetables—potatoes.
2. Cereals.

Cooking—breaks the starch grains.

VII. Sugars.
1. Source.
2. Composition.
3. Food value—digestion.
4. Conservation.

VIII. Fats and Oils.
1. Source—animal, lard, butter;
   vegetable, olive oil, nuts, corn.
2. Composition.
3. Food value—heat givers.
4. Cooking.

IX. Proteids.
1. Source.
2. Composition.
3. Food value—flesh formers—also give heat.
4. Cooking—eggs, milk, cheese.

X. Meats.
1. Structure of lean meat
2. Composition.
3. Classification of methods of preparing meats according to their nutritive value.
   1. Extraction—soups, broths, bouillon, beef, tea.
   2. Conservation—roasting, baking, broiling, pan broiling.

Gelatine is obtained from bones and tissues. Easily digested and absorbed.

After this course was finished, these students graduated into the last class—that for first-aid work. This class was conducted by a competent physician under the direction of the school board, and was also thrown open to the attendance solicited from all foremen and executives in the plant. This class was called after hours, or from 5:30 to 6:30 p.m., and all attending were paid straight hourly rates for their presence.

Part-Time Instruction Planned

It was decided that in order to strengthen the organization, the calibre of foremen must be improved and their general understanding and power to think must be stimulated. Therefore, a class in part-time instruction was planned and put into operation in the spring of 1919.

A competent instructor from the Great Lakes Naval Training School was secured. The foremen from the various departments were drawn in two divisions, 17 each, and the course as mapped out consisted of 3 hrs. per day, 5 days per week, for a term of 16 weeks as shown in Table III.

TABLE III. PART-TIME COURSE FOR FOREMEN

Time, 3 hrs. per day, 5 days per week, 16 weeks; total, 240 hrs.
Monday—Morning, 1½ hrs. drawing; afternoon, 1½ hrs., physics.
Tuesday—Morning, mathematics; afternoon, geography.
Wednesday—Morning, drawing; afternoon, mathematics.
Thursday—Morning, English; afternoon, civics.
Friday—Morning, mathematics; afternoon, physics.
Economics may be combined with civics after six weeks.

Mathematics—Belt speeds, gear ratios; percentage of overhead; percentage of labor cost; volume of boxed goods; power transmitted. Fundamentals taught incidentally.

Geography—General geography of the region, the country, and the world; transportation, especially as it relates to products of the factory; products, especially metals.

Economics—Principles of value, elements of cost, balance of costs; money and value.

Physics—Principles of machines, energy, power, elements of electricity, mechanics, elements of heat.

English—Practice in accurate expression, use of punctuation, brief descriptions, letters of application, reports; general suggestions in regard to reading; free use made of trade papers, articles criticized in regard to the English uses.

Civics—General study of city, state and national governments; study local civic activities, political and social.

Mechanical Drawing—The principles of projection, simple sketching, actual drawing of simple machine parts; problems in mechanism, layout of shops, etc.

Shop problems—Discuss with executives various problems of shop management, especially those which involve mechanical difficulties.

In order to bring home the course very thoroughly, this course was supplemented by a series of lectures covering: (a) Necessity for an educational course; (b) lectures covering quality of product; (c) lectures covering principles of supervision.

The first series covered the following:

1. "The Purpose of an Educational Department," by general manager.
2. "The Need of a Quality Product," by sales manager.
3. "The Effects of Perfect Administrtaion," by works manager.
4. "Opportunity Offered by Education," by general manager.
5. "Education as a Means toward Quality Product," by superintendent of vocational education.

The second series, on quality of product, covered the following:

6. "What Is Quality?" by chief engineer.
7. "The Cost of Quality," by general manager.
8. "Quality vs. Production," by works manager.
9. "How Is Quality Secured?" by industrial engineer.

The third series, on supervision, embraced:

10. "Supervising Men and Women," by general manager.
11. "Record of Employees' Performance," by works manager.
12. "Accumulative Progress Records," by industrial engineer.
13. "Records of Complaints and Suggestions," by works manager.

Following this series, a second series on company problems was given, consisting of nine lectures, three on mechanical problems and mechanism, by the chief engineer, and the others on production and production control, and cost accounting procedure as applied to company business, by the production manager and cost accountant.

At the end of each month a report card, as shown in the cuts, is made out for all students in the various classes and is turned in to the works manager in charge of the educational department for inspection. It is then returned to the teacher who retains it after inspection by the student.

Executive Class Organized

Not only is education confined to foremen and operatives, but it is also offered to executives who have the time to spare to better fit themselves for more responsible positions. In the fall of 1918 a class was organized of executives from the general manager down, taking up a standard set of a certain correspondence school's texts, covering the following lines in business administration: Corporate organization management; cost accounting and financing; stocks and bonds; business law and many kindred subjects.

Owing to the pressure on all executives, the time of meeting was placed from 5:10 p.m. to 6:30 p.m., once per week, generally on Thursday. Approximately 160 pages of reading matter were assigned for a two weeks' period. A leader was appointed who made assignments of approximately 10 pages of reading matter to each executive. This necessitated the leader doing a certain amount of his work a week in advance of the rest of the class. The leaders so appointed held office for two meetings in succession and were appointed in rotation.

Discussion

On the convening of the class at 5:10 p.m., the leader called in sequence on the members for a 5-min. report on the sections of the text which had previously been assigned them for preparation. This continued for about 50 min., and the last 30 min. were taken up in a quiz and general discussion based upon the questions in the text and conducted by the leader. This discussion was entirely informal, but it rested upon the leader to see that it was a snappy, well-conducted and logical discussion, and that it led somewhere. Whenever a problem in the lesson occurred it was always solved and handled during this discussion.

This covers the present scope of educational work as carried out in the Diamond Chain and Manufacturing Co. The results to date have been very gratifying and the labor turnover, which has been carefully watched, as a result has shown a most gratifying decline.

A Graphical Method for Finding Accurate Center Distances

By R. JANTSCH

This scheme for obtaining center distances with extreme accuracy should prove valuable to the men who have to carry out the details of close-limit work as specified by the modern planning department. It is a whole lot easier to say that a certain distance shall be accurate to a ten-thousandth than it is to measure that distance in a hurry.

THE writer believes the method described in this article, is not generally known, and since it is quick and reliable, it will no doubt be appreciated by the draftsman who is frequently called upon by the shop to figure out in a hurry coördinate measurements for accurate center distances; particularly in cases where the chance of error by figuring is great because of the complicated trigonometrical or analytical solution.

To find the exact coördinate measurements for the distances of a number of points, a layout is made of these points (an actual-size layout is in most cases satisfactory). From this layout the desired measurements are first approximately obtained by scale reading. In this connection it should be mentioned that since the measurements are to be given in decimals, it is preferable to use a scale graduated in 10ths, 20ths, 50ths and 100ths. Using these approximate measurements with the simple trigonometrical formula $c = \frac{a}{\sin A'}$ the error of approximation is found and from the latter the exact coördinate measurements by means of the simple method described in what follows:

In Figs. 1, 3 and 5, a and c are fixed points, ab and cd straight lines, the ends b and d of which are supposed to meet at e, but do not because e is not where it should be. The problem is to move e to e'. This is done by drawing arcs be' and de' with centers at a and c respectively. Now if for instance ab is about 3 in. and eb about 0.02 in. and cd and de have similar proportions, the curvature of arcs be' and de' is so infinitely slight compared to the length of the curve that it can be considered zero for all practical purposes. Hence be' and de' can be considered as the tangents of arcs be' and de' at points b and d respectively and point e' the point of intersection of tangents be' and de'.

But in order to determine the minute movement of e to e' graphically, it will be necessary to make a considerably enlarged layout of the points which determine the distance ee'.

In Figs. 2, 4 and 6 these enlarged layouts are shown. An enlargement of 500 to 1 will be found satisfactory in most cases.

If for instance in Fig. 1, $de = 0.0215$ in., then the corresponding distance $d'e$ in the enlarged layout, Fig. 2, would be $0.0215 \times 500 = 10.75$ in. and similarly

$eb = 0.0123$ would be enlarged in Fig. 2 to $eb' = 0.0123 \times 500 = 6.15$ in.

In Fig. 2, we measure $Y = 15.2$ in. and $X = 0.4000$ in. If $\frac{15.2}{500} = 0.0304$ is added to the approximate first scale measurement af in Fig. 1, the exact measurement of af is obtained; and, similarly, if $\frac{X}{500} = \frac{0.400}{500} = 0.0008$ is subtracted from the approximate first scale measurement ef in Fig. 1, the exact measurement of ef is obtained.

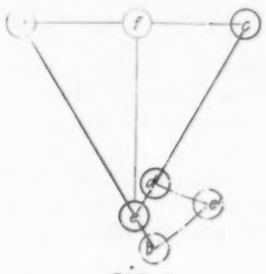


FIG. 1

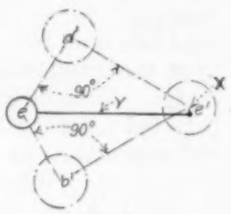


FIG. 2

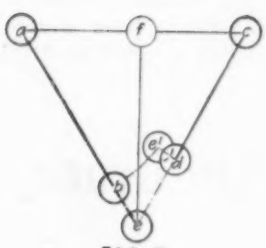


FIG. 3

FIG. 4

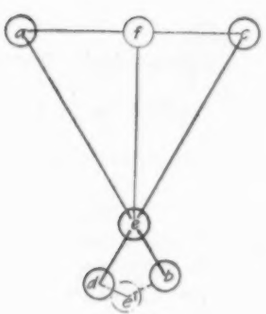


FIG. 5

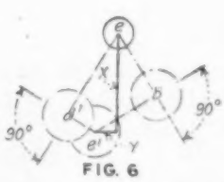


FIG. 6

FIGS. 1 TO 6. LOCATIONS OF POINTS TO STANDARD AND ENLARGED SCALES

Following is a typical example with layout, Fig. 7, which can be solved to advantage by this method:

EXAMPLE, FIG. 7

Find: ay, cy, ax, bx, ez, fz.

Given: $ab = 3.0003$ in.; $bc = 3.0625$ in.; $cd = 4.9376$ in.; $ac = 4.9373$ in.; $ef = 4.8040$ in.; $fg = 4.8000$ in.

(1) Find ay and cy.

From layout find the approximate measurements: $ay = 3.96$ in.; $cy = (4.37 - 1.4375) = 2.9325$ in.

$$\text{Tan } D = \frac{4.37}{6.2749 - 3.96} = 1.88777$$

From sin table we find sin $D = 0.88368$.

Then the approximate distance

$$cd = \frac{cy + 1.4375}{\sin D} = \frac{4.37}{0.88368} = 4.9452 \text{ in.}$$

The error of approximation of

$cd = (4.9452 - 4.9376) = +0.0076$ in.

In the same manner we find:

Tan $A = 0.74053$; sin $A = 0.59512$;

$$ac = \frac{cy}{\sin A} = \frac{2.9325}{0.59512} = 4.92758 \text{ in.}$$

The error of approximation of

$ac = (4.9373 \text{ in.} + 4.92758 \text{ in.}) = -0.0097$ in.

Now we make the enlarged layout:

$cc' = +0.0076 \times 500 = +3.8$ in.; $cc^3 = -0.0097 \times 500 = -4.85$ in.

We measure $cc^4 = 0.75$ in. and $c^3c^4 = 6.54$ in.

Then ay (exact measurement) $= ay$ (approximate) $+ \frac{c^3 c^4}{500} = 3.96 \text{ in.} + \frac{6.54}{500} = 3.9731$ in.

And cy (exact measurement) $= cy$ (approximate) $- \frac{cc^4}{500} = 2.9325 - \frac{0.75}{500} = 2.9310$.

Exactly the same procedure is followed for finding ax, bx, and ez, fz.

(2) Find ax and bx.

Approximate measurement: $ax = 0.92$ in.; $bx = 2.84$ in.; tan $B = 3.08695$; sin $B = 0.95133$; $ab = 2.98529$ in.; tan $C = 0.02980$; sin $C = 0.02979$; $bc = 3.0547$.

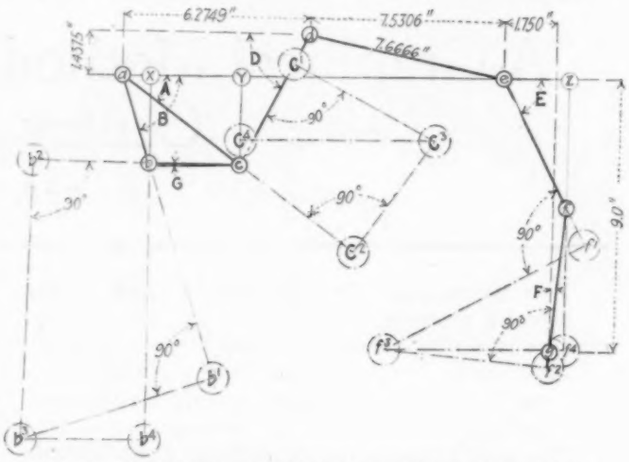


FIG. 7. PROBLEM IN FINDING CENTER DISTANCES

Error $ab = -0.0150$; error $bc = -0.0078$ in.

Enlarged layout $bb' = -0.015 \times 500 = -7.5$ in., $cc^4 = -0.0078 \times 500 = 3.9$ in., $cc^1 = 9.2$ in., $c^3c^4 = 4.11$

ax (exact) $= 0.92 - \frac{4.11}{500} = 0.91178$; bx (exact) $= 2.84 + \frac{9.2}{500} = 2.8584$

(3) Find ez and fz

Approximate measurement: $ez = 1.750 + 0.54 = 2.29$ in.; $fz = 4.22$; tan $E = 1.8427$; sin $E = 0.087894$; $ef = 4.8012$ in.; tan $F = 0.11296$; sin $F = 0.11225$; $fg = 4.81069$.

Error $ef = -0.0028$; error $fg = +0.0107$ in.

Enlarged layout: $ff' = -0.0028 \times 500 = -1.4$ in.; $ff^2 = +0.0107 \times 500 = +5.35$ in.; $ff^4 = 4.75$ in.; $f^2f^4 = 5.95$ in.

ez (exact) $= 2.29 \text{ in.} - \frac{5.95}{500} = 2.2781$; fz (exact) $= 4.22 + \frac{4.75}{500} = 4.2295$ in.

Old English Machine Tools at Soho, Birmingham

By I. W. CHUBB
European Editor, *American Machinist*

In this article some of the machine tools used by Boulton & Watt are illustrated and described. A study of certain of the details will show that the designers of these tools were not so far behind the times as might be imagined. One old lathe is shown with an arrangement for reversing the change gears that might well be the progenitor of the quick-change gears used on lathes of today.

AMONG the historically instructive visits made by the participants in the Watt Centenary celebration, held in the Birmingham district toward the end of September last, the tour of the parts of the works of W. & T. Avery, Ltd., that formed sections of the original Soho Foundry was not the least informative. The foundry has been claimed to be "the first works that the world has ever seen; that is, it was the first works to employ machinery to make machinery." In the minds of some readers of the work of the older British engineers, Soho Foundry is occasionally confused with the Scho Factory. The latter was about a mile away, and was built in 1765 by Boulton, at a cost of £9,000, and was used for the making of small metal ware such as inlaid steel buckles, chains, buttons, etc., and for producing coins, medals, candelabra, vases, etc.

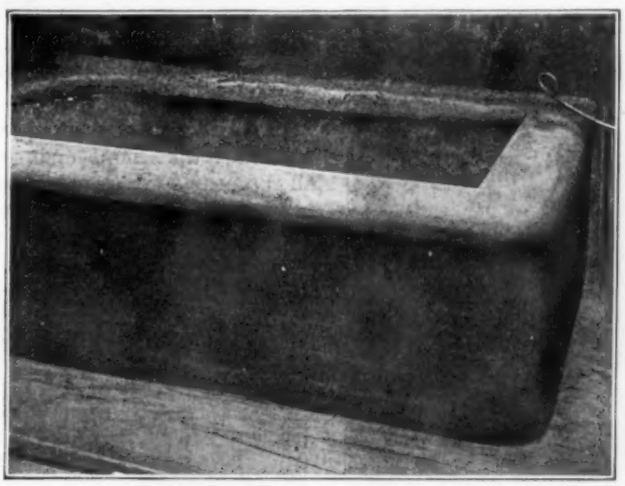


FIG. 2. WATT'S BATH TUB

The Soho, or perhaps better, Smethwick Foundry was built as an extension in 1796 for the firm of Boulton & Watt, who had joined in business in 1775. When James Watt the younger died in 1848 the title of the firm was altered to James Watt & Co. and from this firm the foundry was purchased in 1895 by the present owner, W. & T. Avery, Ltd., manufacturer of weighing, counting, testing and other machinery. The original entrance is in existence, with the old drawing offices above, and behind them the private offices of the old firm, the lower floor being occupied then by clerks, while the cashier and others were on the other side of the gates. The clock installed in 1812 is still in use. Watt's stables have recently been converted into stores. Foundry Row, headpiece, was built at the same time as the works but only one-half now remains. The larger houses were occupied by the foremen and the others by workmen, while the house on the extreme left hand, marked by a tablet at *A*, was occupied by William Murdock in 1817.

Some little distance away, but still a part of the works area, is the site of the first gas holder. An old circular gasholder still exists, but whether it was the original one may possibly be doubted, as the first drawings show one of a rectangular form. In the distance, something like a mile away, is Sycamore House, where Murdock afterward lived and which still stands. A copper pipe was used to convey the gas to this house, which is thought to be the first private residence thus illuminated. W. & T. Avery, Ltd., states that part of the copper pipe was found a few years ago when excavations were being undertaken for another purpose. Fig. 2 shows a bath which was used by the principals of the firm, including, it is understood, Watt, Boulton and Murdock. This bathroom is not now used for any purpose; in fact, it merely exists.

Among the shops is the one where the engine was built for Fulton's steamship, the first steam-propelled vessel made; the engines of the Great Eastern were also built there. Now testing machines are erected in the

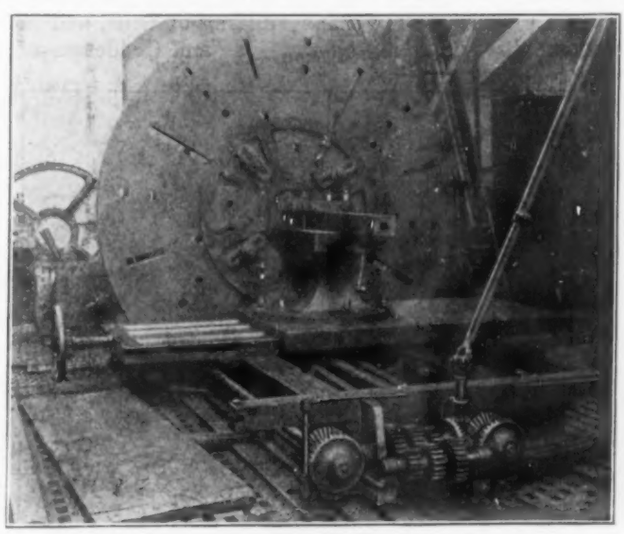


FIG. 3. PIT LATHE 90 YEARS OLD

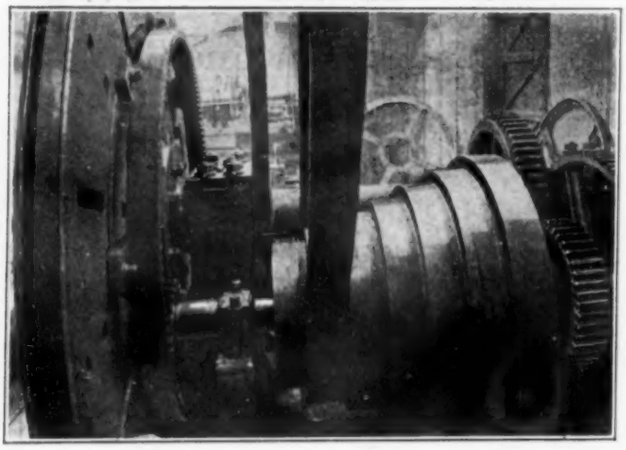


FIG. 4. FACEPLATE DRIVE ON OLD PIT LATHE

same building. Adjacent is the erecting shop which is understood to have been opened by Boulton with a roaring feast. Boulton's speech has been recorded as follows:

"I come now as the Father of Soho, to consecrate this

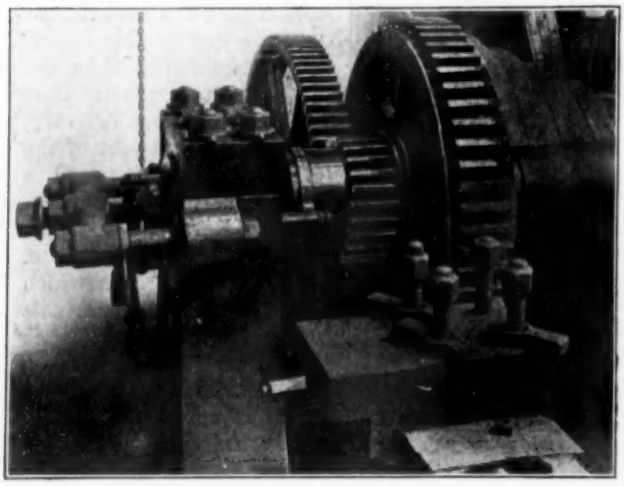


FIG. 5. SPINDLE THRUST ON OLD PIT LATHE

place as one of its branches; I also come to give it a name and my benediction. I will therefore proceed to purify the walls of it by the sprinkling of wine, and in the name of Vulcan and all the Gods and Goddesses of

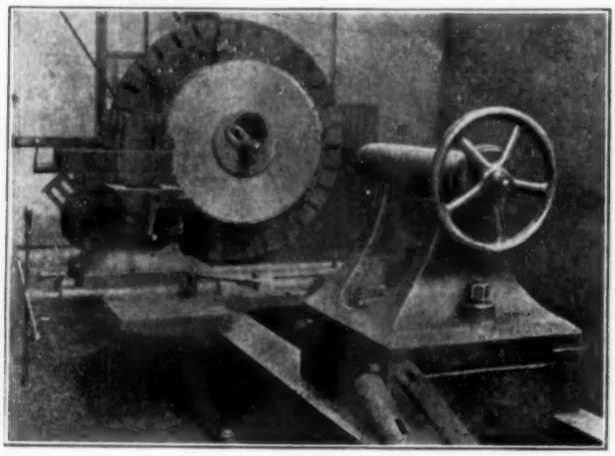


FIG. 6. SCREW-CUTTING LATHE BUILT IN 1842

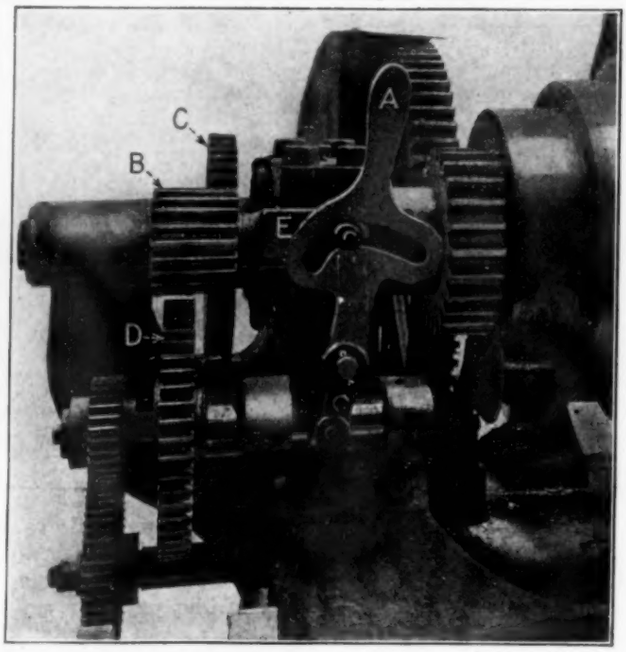


FIG. 8. CHANGE- AND REVERSE-GEAR SYSTEM ON LATHE SHOWN IN FIG. 6

Fire and Water, I pronounce the name of it Soho Foundry. May that name endure for ever and ever, and let all the people say Amen, Amen. This Temple now having a name, I will propose that every man shall fill his pitcher, and drink success to Soho Foundry. Let me

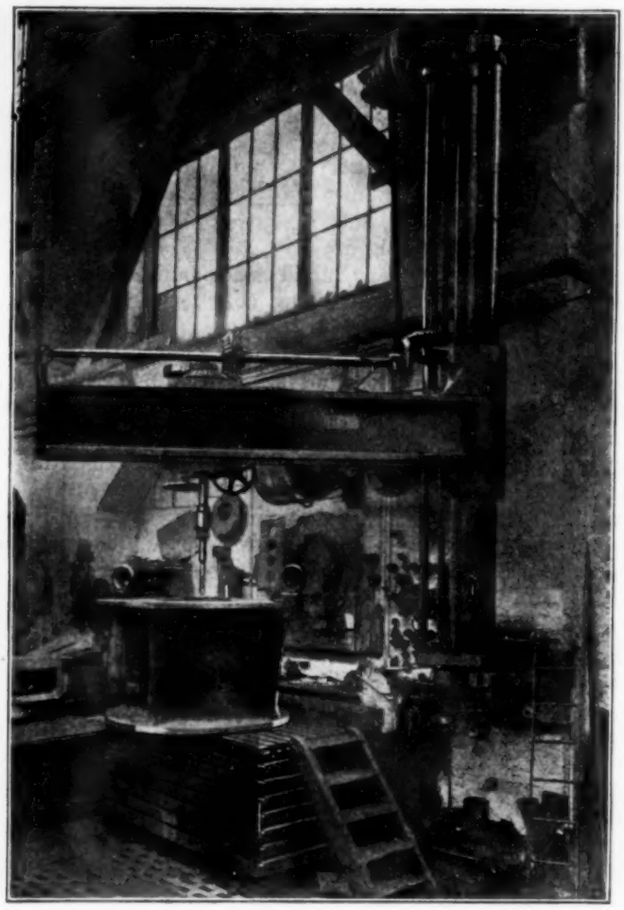


FIG. 9. RADIAL DRILLING MACHINE DESIGNED IN 1845

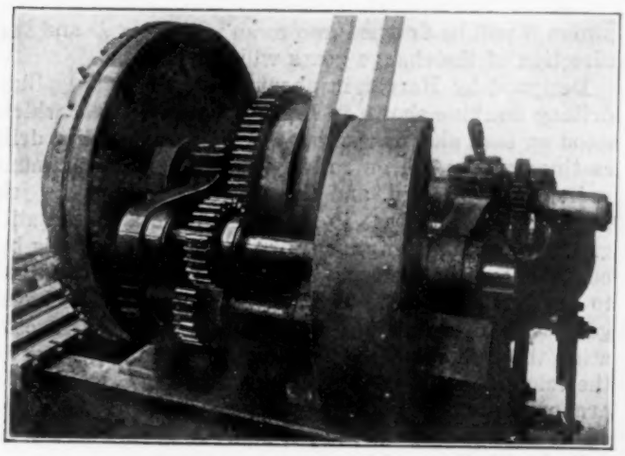


FIG. 7. GEARING AND FACEPLATE DRIVE ON LATHE SHOWN IN FIG. 6

FIG. 13. BOULTON'S MINT BUILDING, NOW USED AS A BLACKSMITH SHOP

give my benediction to Soho Foundry. May this establishment be ever prosperous. May no misfortune ever happen to it. May it give birth to many useful arts and inventions. May it prove beneficial to mankind, and yield comfort and happiness to all who may be employed in it. As the smith cannot do without his striker, so neither can the master do without his workman. Let each perform his part well, and 'do his duty in that state to which it hath pleased God to call him,' and this he will find to be true rational ground of equality. One serious word more, and then I have done. I cannot let pass this day of festivity without observing that these large piles of buildings have been erected in a short time, in the most inclement season of the year, without the loss of one life or any material accident. Therefore let us offer up our grateful thanks to the Divine Protector of all things, without whose permission 'not a sparrow falleth to the ground.' Let us chant Hallelujahs in our hearts for these blessings, and with our voices, like loyal subjects, sing 'God Save Great George the King.'" Several old machine tools remain and, in fact, are in use; but only a few years ago they were accompanied by quite a number of others, since removed and broken up. Still employed, for instance, is the faceplate pit lathe, illustrated in Fig. 3, which is understood to be the first lathe with a pinion working on a toothed ring at the back of the faceplate; see Fig. 4. This machine

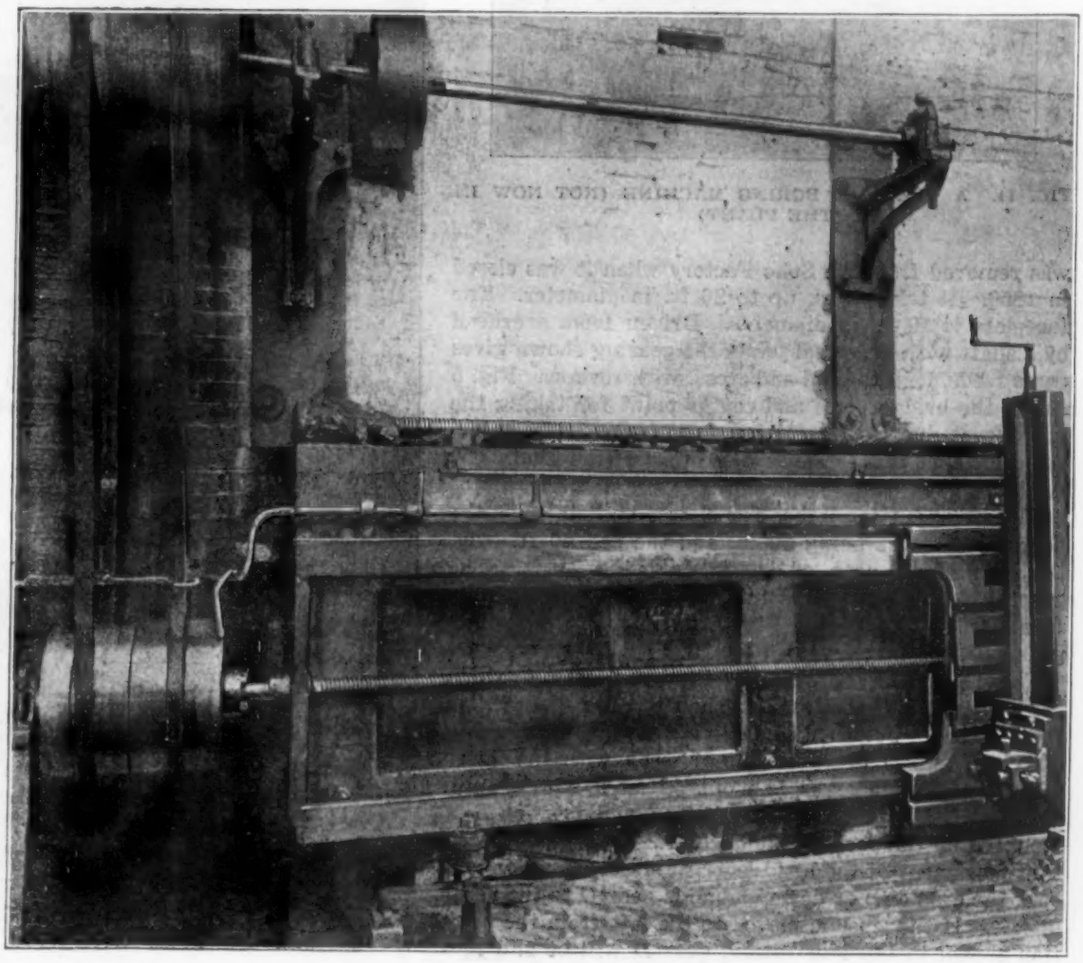


FIG. 10. WALL PLANING MACHINE 120 YEARS OLD

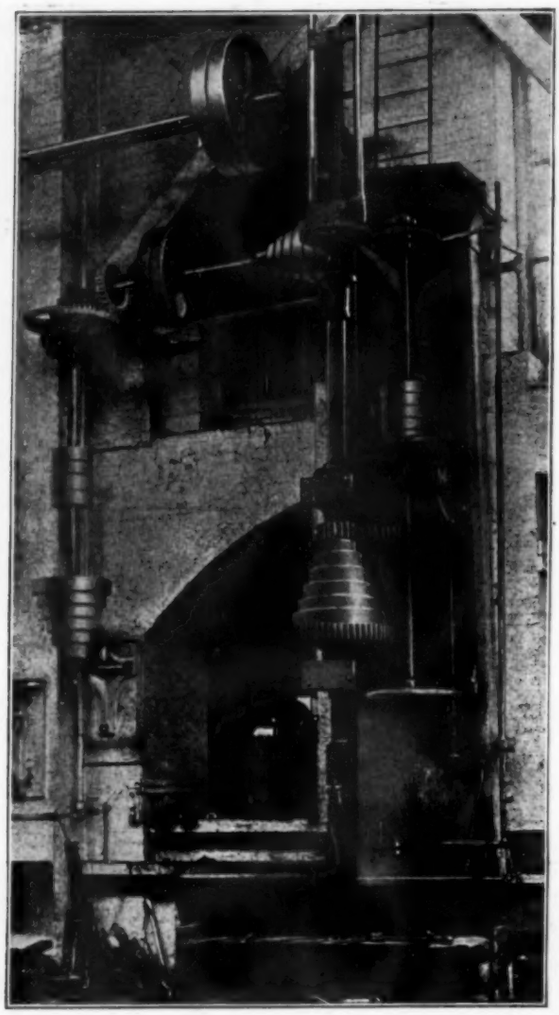


FIG. 11. A VERTICAL BORING MACHINE (NOT NOW IN THE PLANT)

was removed from the Soho Factory when it was closed in 1850. It takes work up to 26 ft. in diameter. The faceplate is 10 ft. in diameter. Driven from overhead by a shaft with universal joints the gearing shown gives three feeds, longitudinal and cross, with reverse. Fig. 5 shows the bridge piece and center point for taking the end thrust due to the cutting action, and it is understood too that this is the first example of the kind. The lathe has been running 90 years.

The screw-cutting lathe, Fig. 6, was built in 1842, the height of centers being 30 in. and the bed 40 ft. long, the maximum length of job taken being 31 ft. The gearing for the head, including the pinion driving the faceplate, will be seen in Fig. 7, a detail of the change-gear system being given in Fig. 8.

These gears are actuated by the hand lever *A* which has a cam-shaped slot, and, as shown in the illustration, the pinion *B* between the driving and the following wheels *C* and *D* is raised out of mesh with the lower wheel *D*. The gear *D* is mounted on a sliding quill attached to the tail of the hand lever, while pinion *B* is mounted on the rocking cradle *E*. It will thus be seen that movement of the hand lever in either direction will rock the cradle up or down and slide gear *D* to the right or left. If the lever is moved to the left from the position shown in the illustration, gear *D* will be slid into mesh with gear *C*. If the lever is moved to the right the pinion *B* will be dropped into mesh with gear *D* and the direction of the change gears will be reversed.

Designed by Harper in about 1845, the radial pillar drilling machine shown in Fig. 9 is one of a pair which stood on each side of the gateway and was used to drill castings while still on railway trucks. The maximum radius is 8 ft. 6 in. and the machine will take a job about 10 ft. from base to underneath the arm and still give a reasonable length for the drill. The drive is by belt to a cone at the top. This drives bevel gears fitted to the vertical shaft. The latter carries another bevel gear which drives the horizontal shaft, this in turn actuating the drill spindle. A set of gears at the bottom of the column can be put into action to raise or lower the arm and the feed is driven by spur gearing on the hand-wheel shaft and operated by a cam. A 2½-in. hole can be drilled with the machine.

The wall planing machine, shown in Fig. 10, is regarded as the oldest machine in the works; it is said to be the first wall planing machine built and is known to be 120 years old. Above it, carried on the wall, is a spare screw cut 25 years ago in order to replace the

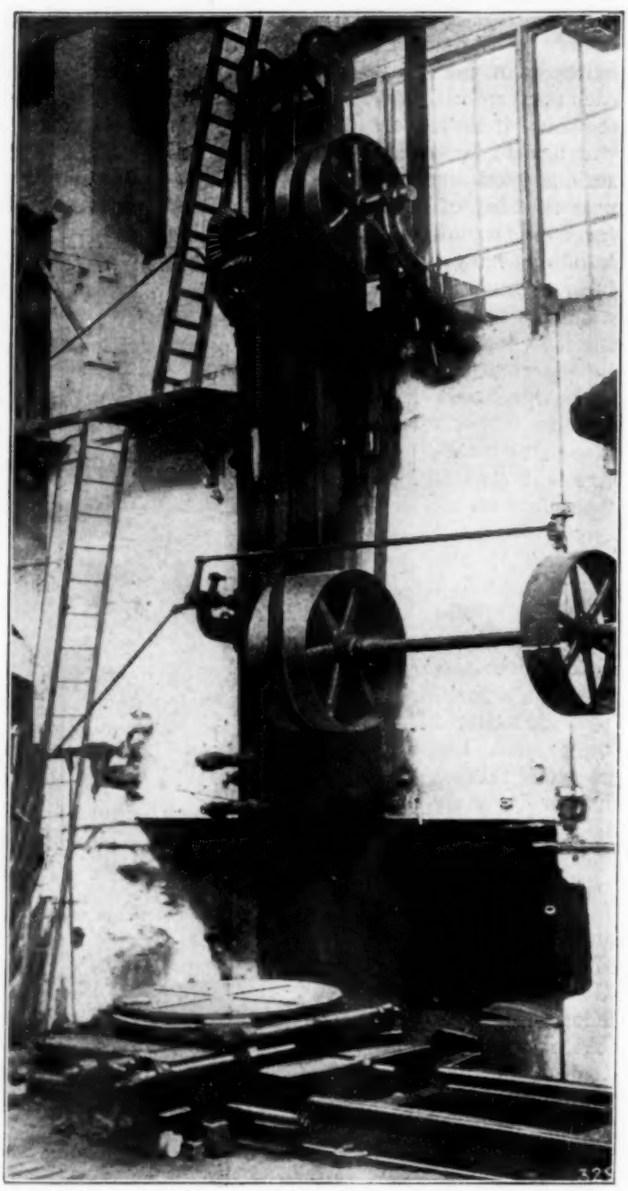


FIG. 12. A SLOTTING MACHINE (NOW DISMANTLED)

existing screw when worn. This machine will take work 15 ft. long: it is used on weighbridge frames. Another old wall planing machine in the works covers a space of 27 ft. by 9 ft., and the screw is 4 in. in diameter, double-thread. It was frequently used in conjunction with another machine adjacent, the two together being capable of covering 45 ft. in length.

Figs. 11 and 12 illustrate machines not now in use. A vertical boring machine is shown in Fig. 11, but as it has been disposed of it is impossible to obtain particulars. Fig. 12 shows a heavy slotting machine with 3 ft. 6 in. stroke. It is driven by bevel gearing and a square-thread screw to the ram, the thread being 4 in. in diameter by $\frac{5}{8}$ in. pitch. The ram is counterbalanced by weights suspended from wire ropes passing over pulleys at the top. This machine, however, has been dismantled.

The Greenfield Tap and Die Corporation Plan of Industrial Representation

By FRED H. COLVIN
Editor, *American Machinist*

This article outlines briefly the method of securing and maintaining personal contact between the workers, shop executives and the management in the plants of the Greenfield Tap and Die Corporation. It shows an appreciation of the necessity for greater co-operation and confidence, as well as that the shop influence extends far beyond the factory itself. It gives the opportunity for inquiry or expression which prevents small misunderstandings being nursed into large grievances.

THE Greenfield Tap and Die Corporation and its employees are endeavoring to work out a plan for securing individual expression and co-operation as a means of increasing production and bettering conditions generally.

As a prelude to the industrial administration constitution, there are seven statements to which all can subscribe. These are:

1. We believe in a square deal on the part of management and workers, one toward the other and both toward the community.

2. We believe that the principal desires of management and workers are identical, namely, happiness; that the basis for happiness is health, progress, opportunity and prosperity.

3. We believe industry, the most important factor in determining the basis of happiness, must recognize that men are men, something more than mere machines, something more than money—recognition being the basis of self-respect.

4. We believe management should give just returns for work performed; should provide opportunity to learn and grow; should establish clean, orderly, safe and sanitary working conditions, proper equipment, reasonable hours, and opportunities for recreation and rest.

5. We believe workers should give honestly applied energy, constructive thought to the reduction of cost and the production of the highest quality of product, regular and dependable service; that they should assume responsibility for indolence, indifference, restriction of output and poor workmanship.

6. We believe workers should be loyal and enthusiastic, should boost for their company product, management and fellow workers.

7. We believe management and workers, comprising industry, will effect better mutual and community happiness by co-operation, stimulated through representation, and based on the principle of democracy—a square deal.

With the foregoing as a basis, an industrial administration constitution was drawn up, with the object of establishing a unanimity of purpose between employees and their employers.

It is hoped to create means for the equitable adjustment of difference; by creating a common basis of understanding, co-operation, and decision pertaining to working and living conditions, and such other matters of mutual welfare as their relations may concern; by the establishment of such environment as will tend to safeguard more carefully the life and health of the workers; by providing means of practical education and nationalization, developing both mind and matter to the betterment of the workers as a whole.

This, it is believed, will reduce the cost and waste caused through misunderstandings, and that by applying the saving thus effected both the employee and the employer will be benefited.

The plan of representation includes chosen representatives of departments. These representatives constitute the general assembly, the branches being divided into legislative and the judiciary.

The legislature is composed of representatives of general employees, office employees and both skilled and non-skilled workers. Their primary purpose is to make suggestions and to deliberate on the suggestions that may be referred to them at the option of the upper body.

Where the Shop Executives Come In

The judiciary is composed of foremen, assistant foremen and department heads. Its function is to interpret and sift the suggestions of the legislature and to make recommendations of its own to the upper body. It is also to deliberate on suggestions and recommendations submitted by the upper body.

The executive council is composed of the factory manager, superintendents of different departments and the general foremen. Its function is to devise and deliberate on the suggestions received from the lower body and to refer them to the chief executive or to the board of directors. It also considers recommendations made by the chief executive or the board of directors.

The executive officers consist of the president, vice president, and the board of directors of the corporation.

Representatives to the legislature are elected in the proportion of one for every twenty workers. But each department, no matter how small, is entitled to at least one representative.

There are five standing committees. First is the advisory board on social and industrial betterment, composed of such officers as the chief executive may designate. This meets at least once a month or for special meetings at the call of the chairman.

The joint committee on industrial co-operation and conciliation is composed of six members, three designated by the judiciary and three by the legislature. This committee brings up matters for discussion on its own initiative, or discusses matters referred for its consideration pertaining to the prevention and settlement of industrial disputes, conditions of employment, reported grievances, appeals from discharge and similar cases. This is perhaps the most important committee in its relation to the harmonious operation of the shop. It provides a method of taking up and adjusting small misunderstandings or annoyances before they become real grievances.

There are three other joint committees, one on safety and accident; another on health, sanitation and housing, which includes living conditions as well as the shop itself. The third is a joint committee on recreation, education and insurance. These joint committees meet quarterly unless called in special session. The personnel secretary may, however, confer with any joint committee at any time and may call an impromptu meeting for the purpose of taking up matters requiring immediate attention. This is particularly important from every point of view.

The main advantage to be gained from plans of this nature is the opportunity for self expression on the part of every employee, whether it is exercised or not, and a development of the feeling that he is really part of an organization and not merely a number on the payroll. Confidence in the management is increased, and this goes a long ways toward securing co-operation, which is so badly needed at this time.

Finishing a Commutator in Place

By M. L. Lowrey

The turning of a commutator described on page 1002, Vol. 51, of the *American Machinist*, reminds me of a job that fell to my lot recently.

The collector rings of a 200-kw. alternating-current generator had become so badly worn that it was necessary to have them trued up, and as this machine must run twenty-two hours a day, seven days a week, it was a question how best to do the job, as the machine could be idle only from six to seven in the morning and from six to seven in the evening.

This generator was driven by a steam engine, and it was impossible to run slowly enough to permit turning the rings with a lathe tool; also there was not room enough to use the portable electric grinding machine.

After considerable study, I decided to make a long wheel-arbor that would run in boxes to be secured to the frame of the generator, and with a grooved collar and lever so arranged that the arbor could be moved through the boxes to pass the grinding wheel over the rings. Returning to the shop, I took a piece of 1-in.-round, cold-rolled steel about 3 ft. long, and, after centering and straightening it, one end was turned to ⅞ in. and threaded to fit a nut which, with the flanges, I took from the small shop grinding machine. This was the only thing that had to be made with which to do the job.

From the stockroom I took a small countershaft with its hangers, two 1-in. boxes for the arbor, some used belting, the necessary pulleys, and some bolts and lag-screws. With these I returned to the plant and set up the countershaft over the generator, belting it from the pulley on the generator shaft that ordinarily drove the exciter.

At six o'clock that night I assembled the grinding part of the rig, to see if it was all right, and then took it down again so they could run through the night. Next morning at six o'clock I reassembled the rig, and with a medium-grade, free-cutting wheel the rings were soon ground true. A fine wheel was then placed on the arbor and the rings finished, the brushes replaced and the machine started up before seven o'clock.

The arbor boxes were adjusted for height by shims, and for downfeed, shims were removed as required. The time on the job was seven and one-half hours.

The superintendent was so pleased with the work that he would not allow me to take down the countershaft, but bought the whole rig and kept it for future use.

The Mechanics of the Future

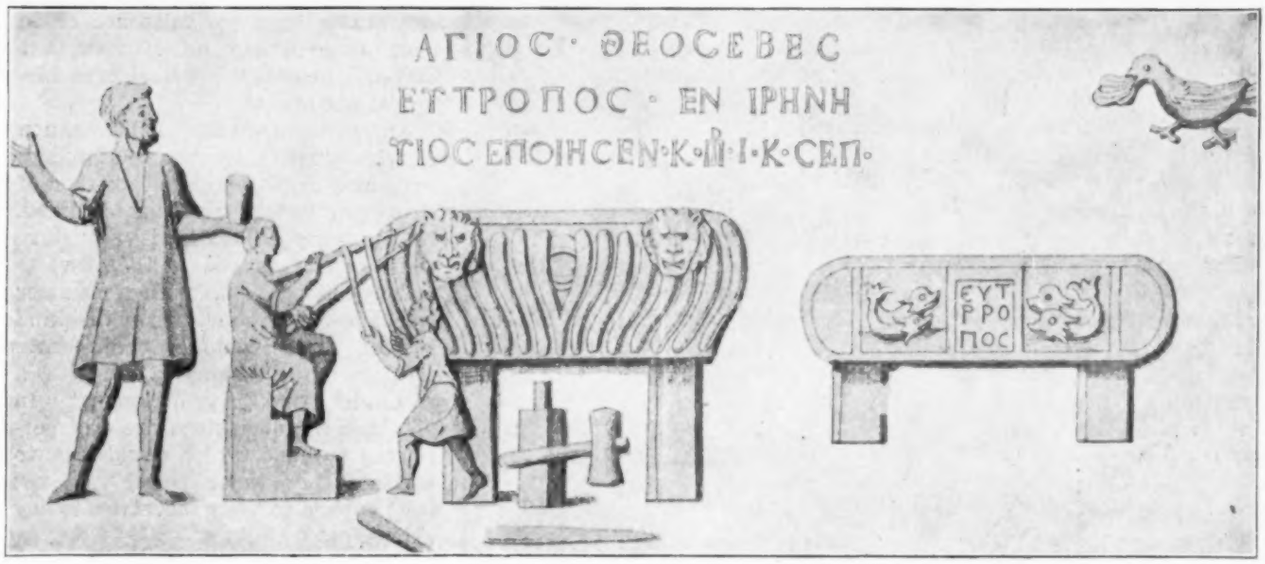
By Fred Price

On page 70 of the *American Machinist*, Joseph T. Taudvin asks what American boys are going to do about the machinist's trade. He draws attention to the fact that the majority of advertisements for shop executives call for technically trained men and he infers that the practical man has a comparatively small chance of working up the line to a responsible position.

Mr. Taudvin also states that the majority of machinists to be found working at the trade at present are foreigners. This depends upon the locality where the observations were made. In all large manufacturing centers, especially in the cities, there are, of course, to be found a large number of foreign-born mechanics. On the other hand, in my travels about the country I have often found localities where the majority of machinists were Americans; indeed, I have worked in some shops south of Mason and Dixon's line where the entire shop's crew were Americans. In many small towns in the Northern States it is nothing uncommon to find the majority of mechanics employed of American parentage.

It is true that technically trained men stand an excellent chance of obtaining the high-paid positions, but it is not the fact that practical men cannot fill these positions that accounts for their absence; it is, rather, due to the fact that practically trained mechanics, men of vision, executive ability and broad training, are indeed hard to find.

If the young man just out of his time will travel and work in different manufacturing centers for a few years with the idea of getting a broad insight into the trade, there is no reason why he cannot work up to an important position if it is in him to do so. It must be borne in mind that executives, whether practically or college trained, are born and not made. All the training in the world will not make a man a good executive if it is not in him to be one. It is a case of the survival of the fittest and the practically trained American seems to stand as good a chance of succeeding as he ever did. It is up to the man himself.



The Evolution of the Workshop—V

By H. H. MANCHESTER

In the fifteenth century, evidences of the tools employed in the workshop and of their gradual improvement become more noticeable and frequent. It is noteworthy, however, that in spite of the invention of printing about 1440, the records of the workshop are from manuscripts.

(Part IV appeared in our last week's issue.)

SEVERAL important factors bearing upon the development of the workshop during the fifteenth century should be kept in mind. One was the tremendous impetus given to metal work by the general use of cannon and firearms which had been invented in the previous century. The second factor was the revival of the arts, resulting in an increase in the employment of ornamental iron and bronze. The third factor was the more common use of horseshoes. The relative importance of this latter factor may be understood by remembering that up to a few years ago a blacksmith's

FIG. 18. AN EARLY PICTURE OF A WATERWHEEL USED TO DRIVE BLACKSMITH'S BELLOWS, FROM A SILVER VASE DATED ABOUT 1400 A. D.

time was confined almost wholly to horseshoeing. Besides these comparatively new tendencies, the demand for armor still continued; the guilds still flourished, and in fact subdivisions into special trades were common.

At the beginning of the century several manuscripts dealing with the new field of firearms were composed which have aided us in understanding the condition of the art of mechanics during that period. Besides dealing with such military subjects as cars of war, attacking and scaling, and engines for throwing missiles and fire, the manuscripts contain interesting sketches of tools, including files, saws, shears, and chisels; also a horseshoe with nail holes. Though somewhat beside our subject, there were also quaint pontoons, boats with paddle wheels, and diving apparatus. Two unexpected

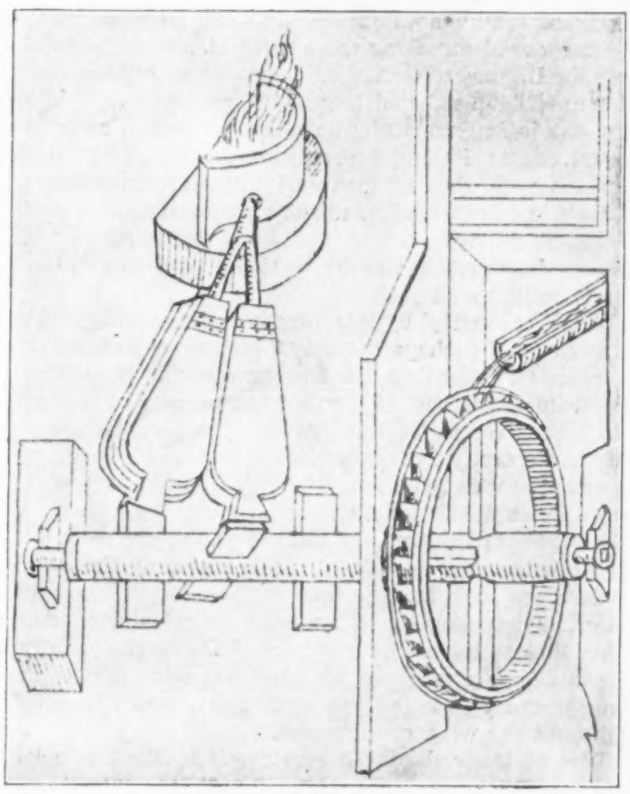


FIG. 19. MARIANUS' CONCEPTION OF A BELLOWS WORKED BY WATER POWER

FIG. 20. THE PRACTICAL ARTS OF 1480, FROM A HOUSE BOOK OF THAT PERIOD

scenes represent elevators hoisting men; probably for the purpose of attacking some fortress.

In the Library of Göttingen is a codex dating between 1430 and 1440 and consisting of two manuscripts. The first one is in German by an unknown author and the second one in Italian, probably by Jacobus Marianus, of Sienna. In the first manuscript are curious sketches of tools and cranes, of hand-run stamp mills, of a hand boring machine for firearms, and of a polishing device, besides boats with wheels, a pile-driver, and many purely military subjects.

In the manuscript by Marianus is an interesting roller conveyor, and perhaps the oldest picture of a crane on wheels. Of immediate interest, however, is the sketch of a waterwheel, Fig. 19, applied to two pairs of bellows which are used to blow a furnace. The importance of this can scarcely be appreciated by us who live in an age of steam, electricity, and gasoline. It is only when we realize that the waterwheel was the first great effort of man toward the use of natural power and was, by all odds, the most important prime mover of the early modern period, that we attach sufficient significance to its gradual application to the different industries. Another illustration of the first part of the fifteen century shows a stamp mill run by hand but with the pestle hung from a bough, the spring of which greatly lightened the work of stamping.

Toward the end of the fourteenth century, Mendel had founded in Nuremberg an institution for superannuated members of the guilds. Some of these members, painters by trade, made pictures of the others while at work. These portraits are crude from an artistic point of view, but they are exceedingly valuable as historical documents.

Among them we find an illustration of wire drawing by means of rollers without a draw plate, and another of wire drawing through a plate by hand. In the same collection is a picture which dates from about 1417, of a file-maker cutting a file with a hammer and chisel. Later pictures of this kind include armor making, chain-armor forging, auger making, a tinsmith, a pipesmith, and a padlockmaker. In all these the operations are still performed by hand, which would seem to indicate that water power had not been applied to these industries to any extent.

The first dated copper-plate engraving seems to have been made in 1446, and from this time we begin to find occasional engravings which incidentally illustrate subjects more or less industrial. For example: one of the early engravers, Israel van Mechenem, produced a cut which illustrated the forging of cutlery and the employment of the grindstone. Other interesting drawings from the latter half of the fifteenth century appear in a house-book of that date. One of these cuts is shown in Fig. 20.

In this book are other cuts showing furnaces, probably used both for smelting and forging; a very crude lathe shown in Fig. 21 and perhaps the oldest known picture of a vise for holding work. Incidentally, the book includes what appears to be the earliest known drawing of a spinning wheel.

Evidence that guilds were still in full force is found in a picture taken from the back of one of the early

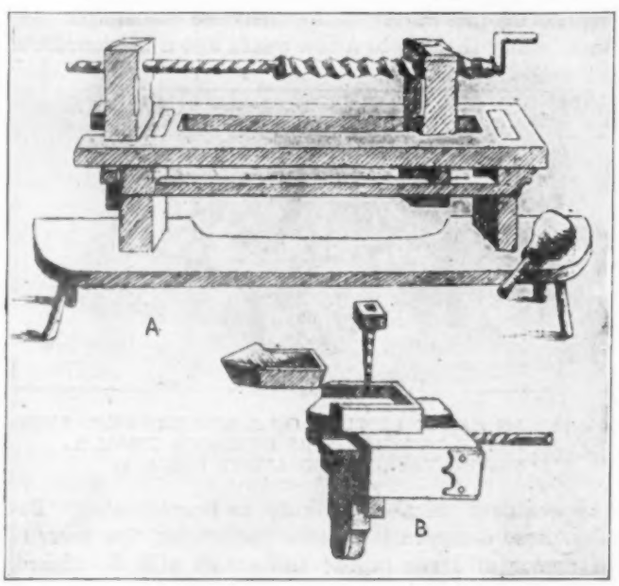


FIG. 21. *A* PROBABLY THE EARLIEST PICTURE OF THE METAL WORKING LATHE. *B* THE OLDEST REPRESENTATION OF A VISE

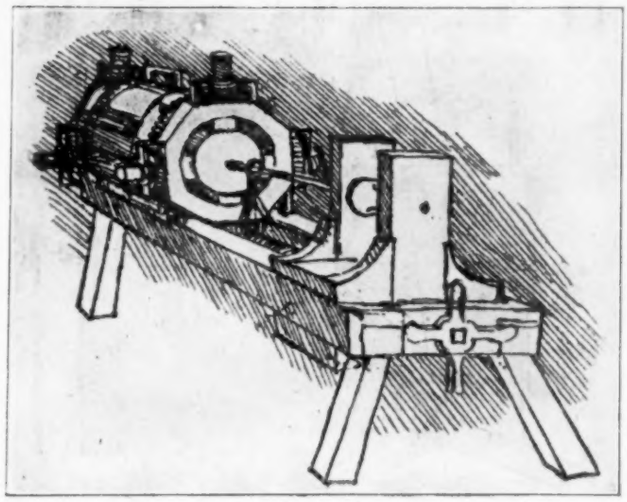


FIG. 22. A HORIZONTAL BORING MACHINE BY LEONARDO DA VINCI

playing cards produced in Italy but now in the British Museum. This shows a locksmith and his apprentice demonstrating their efficiency before the head of the guild. At that date, the guilds were practically in full control of industrial life in the metal and other manufacturing fields in Italy, France, Germany, Austria and England.

The fact that hand labor predominated, fostered the small shop with a master workman and a few journeymen and apprentices, and this in turn lent itself to the guild organization. One characteristic difficulty of this system, however, was already making itself felt. As the theory of the guild was based on the association of shops with mutual interest, a tendency developed to break the guilds into smaller and smaller subdivisions of the trade. Thus, in many places instead of there being one great guild of iron workers, there were separate guilds of founders, hammerers, armorers, locksmiths, cutlers, ornamental ironsmiths, nailmakers, spurriers, horseshoers, and various other crafts each striving to preserve a monopoly in its own field, causing trouble among themselves in fixing the lines of demarkation that separated one from another.

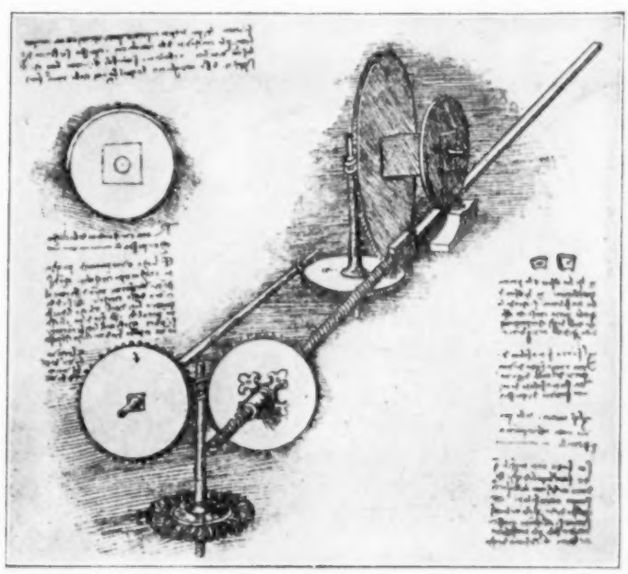


FIG. 23. LEONARDO'S IDEA FOR A WATER-POWER ROLLING MILL

The shops at this time still maintained hours from dawn until dark, and the wages of the full-fledged journeyman in the most advanced cities, such as Florence, were about 50 cents a day at a time when wheat was 80 cents a bushel. In other words, the skilled craftsman of this period had to contend with the high cost of living.

Toward the end of the century, we reach the work of the almost universal genius, Leonardo da Vinci, who lived between 1452 and 1519. His sketches include many ideas for devices which were never constructed; many of them being rough designs for improvements on apparatus already proposed or even experimented with. Whether the designs were ever carried out or

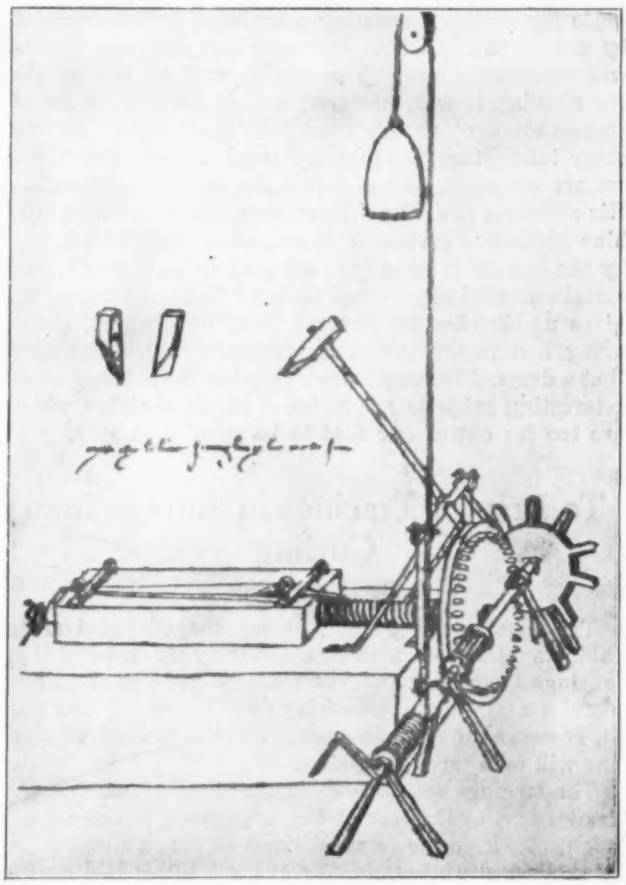


FIG. 24. LEONARDO'S DESIGN FOR A FILE-CUTTING MACHINE

not, they are important as showing the ideas which were then extant.

Among these designs are hoisting machines with wheels, pulleys, screws and clutches, all of which methods were previously known. His two designs of swinging cranes run by tread mills are radical improvements over anything previously designed. His crude sketch of a dredge also seems to be a new departure. Foundry practice occupied a prominent place in his drawings, including a foundry yard, molding and casting of cannon and cannon balls, as well as the molding of statuary. The details representing cannon molding seem to be the first on record though the process had been known before.

It is interesting to note here that he shows molds for concrete, the mixture for which was well known to the Romans, but lost in the early part of the Middle Ages.

There are cuts of furnaces and bellows much the same as those already shown in the military manuscripts. His horizontal boring machine, Fig. 22, is shown in far greater detail than in any preceding cut.

Several rough sketches for crude lathes give an idea of how simple this device still was, but also indicate that engineers were studying to improve it. The horizontal waterwheel had perhaps been used in northern Europe before his time, but two of his designs, showing, without a doubt, the forerunner of the modern turbine and its application to the rolling and drawing of metal, as shown in Fig. 23, are of more than passing interest.

Leonardo's File-Cutting Machine

He pictured a file-cutting machine, Fig. 24, operated by a weight. His idea of a machine for cutting files was apparently new. The employment of the weight for running it was, however, merely an application of an arrangement already used in milling grain. Among other interesting sketches are hand thread cutters for screws and nuts, and a device for sharpening needles. His attempts toward prime movers include a water turbine which was perhaps original, windwheel, wheels run by the hot air from a fire and used to turn a spit, and certain other devices acted upon by fire and steam. He gives us sketches for several kinds of dividers, measuring and mathematical instruments, which indicates that a demand for exactness was being felt. Many other interesting subjects are included in his sketches which are too far out of our field to be mentioned here.

To Prevent Tracings in Storage from Curling

By E. A. Dixie

The illustration, Fig. 1, shows one of our tracing cabinets and the method we employ to prevent the tracings from curling. The tracings vary in size from about 6 x 9 in. up to something like 30 x 48 in. The size is, however, of no consequence as this method of storage will take care of any size.

The tracings are laid flat in the compartments in the drawers or, in the case of the large ones, in the drawer itself. To keep the smallest tracings flat, a single piece of shellacked white pine, 7 x 10½ x ½ in., is laid on the top of the pile of tracings. This piece of wood is a very loose fit for the compartment and has two holes bored in it as shown at *A*, so that it can be easily lifted.

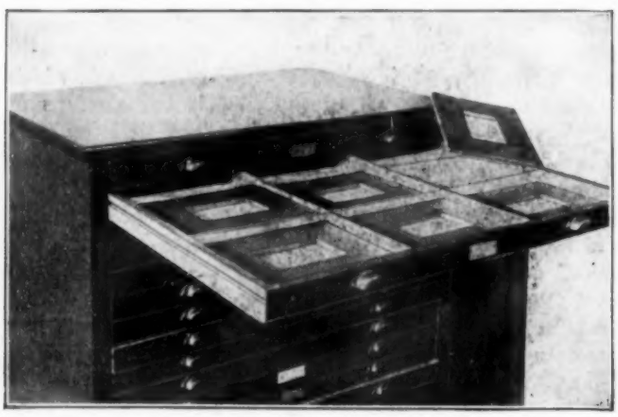


FIG. 1. PREVENTING TRACINGS FROM CURLING

FIG. 2. DETAILS OF BOARDS TO PREVENT CURLING

The larger sizes are rectangular frames as shown at *B*, the opening in the center permitting them to be easily lifted.

For the very large sizes of tracings two ½-in. strips of wood 4 in. wide, as shown at *C*, are laid at each end of the drawer on top of the tracings. This method of storing tracings has been entirely satisfactory.

Ball Anvil for Micrometers

By E. W. Mawhinney

It is sometimes desirable to have a rounded contact point on the micrometer, as when measuring from the inside of curved surfaces. A quickly made and efficient attachment for doing this is shown in the sketch.

This attachment not only holds the ball solid on the anvil but can be made to fit more than one micrometer, which is one advantage over other methods used.

A BALL ANVIL FOR THE MICROMETER

Industrial Motor Control—IV

By C. W. STARKER

In the last few years automatic starting and regulating devices for alternating-current motors have gained considerable importance, and in this article, which is the last of the series, many interesting features of these devices are brought out.
(Part III was published in our Feb. 12 issue.)

IN LARGE installations, such as in steel-mill electrifications, self-starters are used almost exclusively. The magnet-operated switch avoids the necessity of running heavy mains to a distant point for control of the circuit and large currents are easily handled by the main switches, which are controlled by push-button, snap or knife switches at any convenient point. Alternating-current self-starters consist of a series of magnet-operated switches and suitable protecting devices. Two methods of automatic acceleration are used with alternating-current motors; namely, starters equipped with time limit acceleration, and with current-limit acceleration devices. With the time-limit method, the motor is brought up to speed in a predetermined period, which can, of course, be adjusted within given limits. In the current-limit method the motor is started and accelerated slowly if the load is heavy, and quickly if the load is light. The current-limit method is also used primarily with wound rotor (slip-ring) motors, where frequent starting and stopping is required. The time limit, however, is used principally with squirrel-cage motors, on light starting loads, and where overload protection is provided by other means.

A standard form of automatic starter is the double-pole magnet switch, Fig. 35, for the remote control of light or power circuits up to 500 amperes. It is equipped with arc shields and magnetic blowout coils. In Fig. 36 is shown a three-pole alternating-current magnet switch with low-voltage release and magnetic blowout devices.

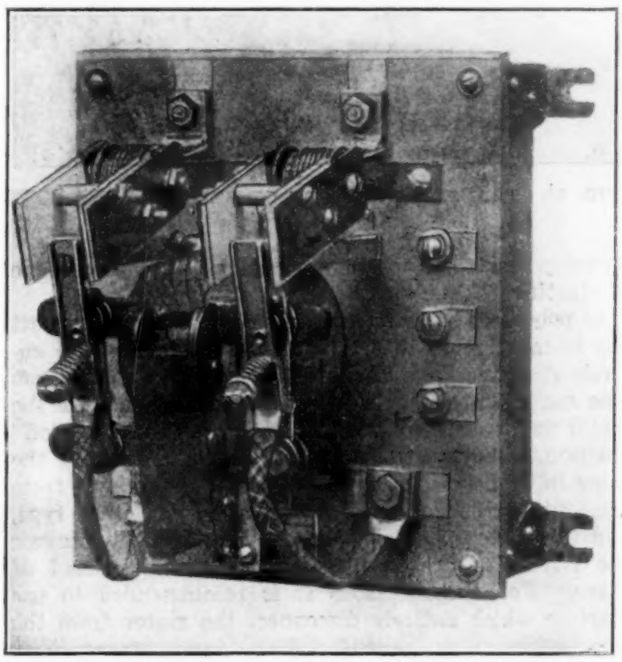


FIG. 35. DOUBLE-POLE MAGNET SWITCH FOR REMOTE CONTROL OF LIGHTING AND POWER CIRCUITS

This switch is operated by a push-button or a knife switch. Magnetic blowouts should always be used where it is necessary to break any considerable amount of current. Switches of similar construction, so called across-the-line self-starters, are used with polyphase squirrel-cage motors or self-starting, single-phase motors up to 15 hp. These may be equipped with overload devices and inverse time element overload protection, which, as the name implies, takes into account the duration of an overload current. The reset of this device may be hand-operated or automatic, to suit local conditions. Sometimes the inconvenience of hand reset may be purposely employed to lessen the abuse of the motor by overloading. In addition to the usual remote-control station devices, float switches, pressure or vacuum devices may be used with alternating-current self-starters to suit individual applications, as well as with direct-current automatic starters.

A type of automatic starter commonly used with alternating-current squirrel-cage motors is the trans-

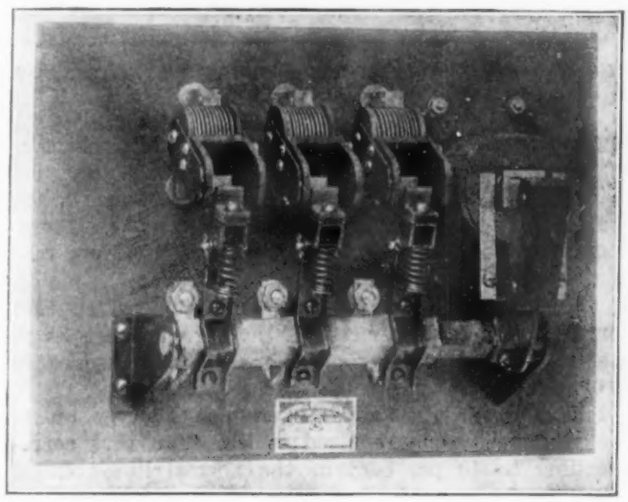


FIG. 36. THREE-POLE MAGNET-SWITCH FOR PUSH-BUTTON CONTROL WITH LOW-VOLTAGE RELEASE AND MAGNETIC BLOWOUTS

former type of self-starter, Fig. 37. It is commercially made for motors up to 200 hp. which are used on centrifugal pumps and similar service, where a starting torque equivalent to not more than 70 per cent of the full voltage is required. An auto-transformer, which is used to reduce the voltage at the motor terminals at starting, is automatically disconnected from the circuit, when the motor is up to full speed. These starters are made in two types, single- and two-step. The former consists of three double-pole magnet contactors, and a dash-pot timed relay. In operation one contactor first connects the starting transformer to the supply lines, a second one connects the starting taps of the transformer to the motor terminals, and the third connects the motor terminals direct to the line, the time element between operations of the contactors being controlled by the setting of the relay. The operation of the two-step starter is identical with that of the single-step, with the exception that one more contactor is used to connect the second transformer start-

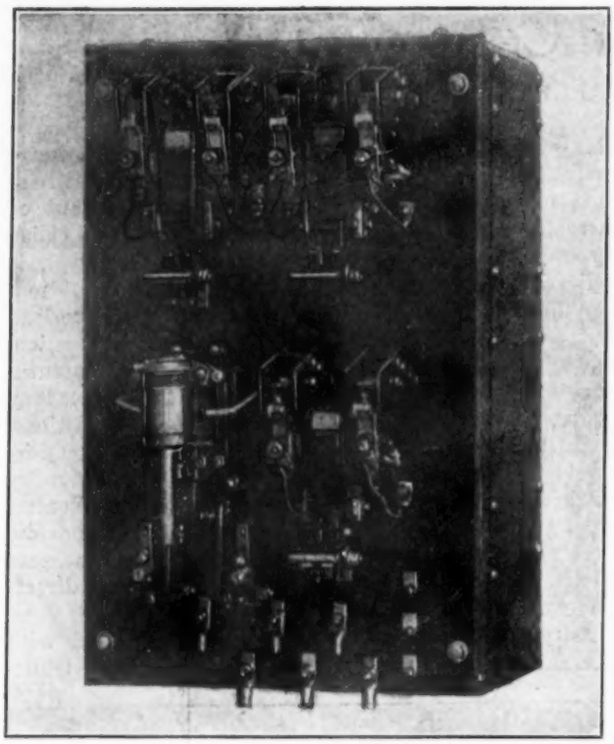


FIG. 37. TRANSFORMER TYPE OF SELF-STARTER FOR LOW-TENSION CIRCUITS

ing tap to the motor terminals, and an additional timing relay is used for the control of this contactor.

The single-step starter is designed for use when the starting torque required is in excess of that corresponding to 40 per cent, but not more than 70 per cent of the normal line voltage is impressed upon the motor. If the starting torque required does not exceed that corresponding to 40 per cent of the normal line voltage, a smoother acceleration and decreased line disturbance is obtained by the use of the two-step starter.

It is, however, of no advantage to use this type, unless the starting torque required is less than that corresponding to 40 per cent of the normal line voltage.

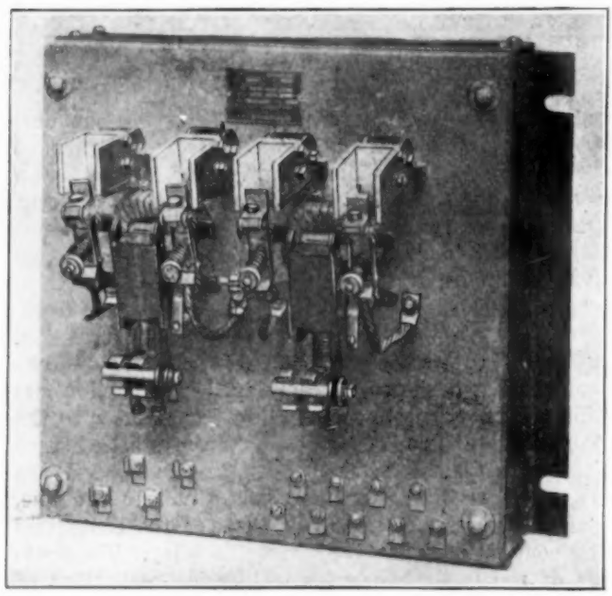


FIG. 39. A FULL-MAGNETIC, PUSH-BUTTON CONTROL ELEVATOR CONTROLLER FOR SQUIRREL-CAGE MOTORS

On both types of starters extra taps are provided on the starting transformer in order to allow some adjustment of the starting voltage. Connections to the transformers are usually made to give 60 per cent of the normal line voltage for starting on a one-step starter, and 40 per cent on the first step and 85 per cent on the second step of a two-step starter. Control of the starters may be by push-button, knife switch or other means.

The starters just described are intended for low-tension motors, 110 to 550 volts, but for the standard high voltages, 1100 and 2200 volts, a type of self-starter, Fig. 38, is used, which employs a step-down transformer. These starters are again made as one- and

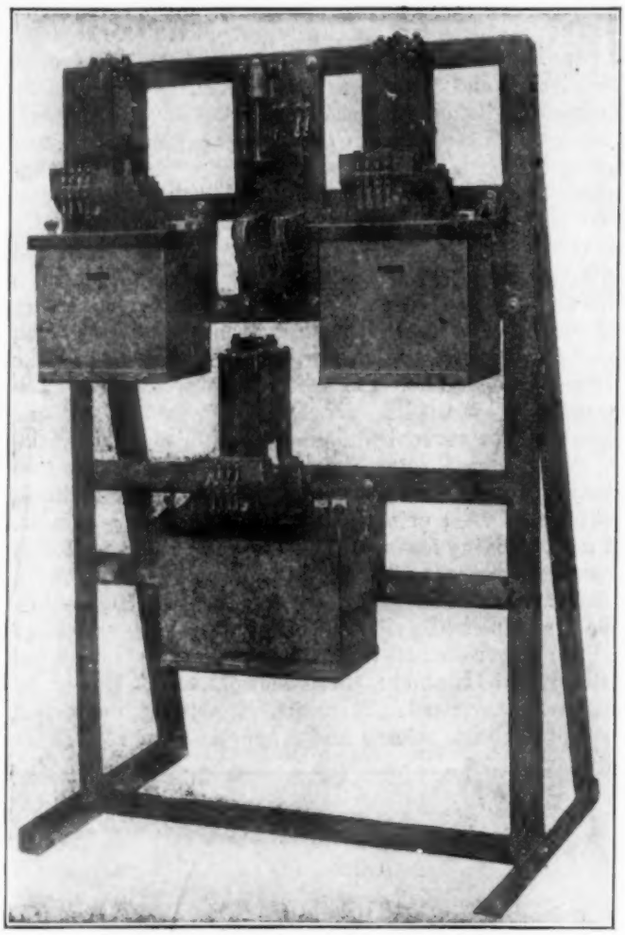


FIG. 38. TRANSFORMER TYPE OF SELF-STARTER FOR HIGH-TENSION CIRCUITS

two-step starters, with limitations as to the percentage of starting voltage similar to the above.

In polyphase starters it is common practice to connect the installation so that the motor and starters are entirely disconnected from the line in the "off" position. The exception to this practice leaves one terminal of the motor and transformer connected to the line in the "off" position. The functions in starting the motor are the same in both cases. In the last case, the danger from accidental grounds is greater than in the other type, and the switch contacts burn up more rapidly because the circuit is broken at only two points instead of three. For these reasons it is recommended to use starters which entirely disconnect the motor from the line.

Until recently the direct-current motor has dominated in elevator service on account of the ease in controlling

its speed. However, slip-ring and squirrel-cage alternating-current motors are now used, particularly for slow-speed elevator work.

A full-magnet, alternating-current elevator controller is shown in Fig. 39. It is designed for push-button operation and for use with single-speed squirrel-cage motors having high-resistance rotors. Such controllers are adapted for use in slow-speed passenger- and freight-elevator service with car speeds of not more than about 125 ft. per minute, and also for dumb-waiter service. The motor is directly connected to the line, and only one speed is obtainable. The control may be arranged for two, three or more landings and may be equipped with floor-stop devices where required.

Full Automatic, Single-Speed Controllers for Low-Speed Elevators

With slip-ring motors, full automatic, single-speed controllers, as in Fig. 40, may be used. These are intended for either freight or passenger elevators with car speeds not in excess of about 200 ft. per minute, and are operated by a car switch. The magnetic accelerating switches are energized by a pilot relay, which has an

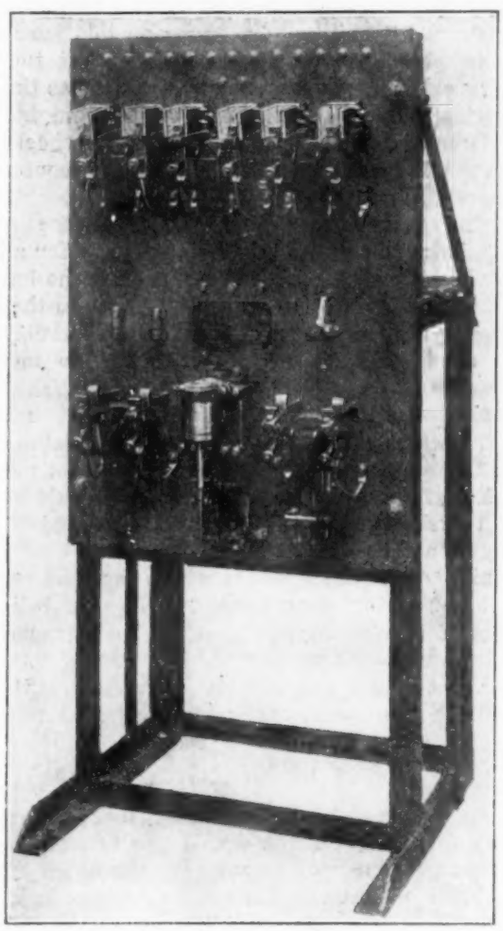


FIG. 40. FULL-MAGNETIC, DASH-POT TYPE, HIGH-SPEED ELEVATOR CONTROLLER FOR SLIP-RING INDUCTION MOTORS

air dash pot for time limiting. Resistance is cut out of each phase simultaneously in order to secure current balance in the rotor circuit during the entire starting period.

In conclusion it might be well to add that local electrical suppliers and power companies should be freely consulted before placing orders for motors and starting devices in order to ascertain correct power factors. Furthermore, when ordering machine tools which are to be factory equipped with motors and starters, special care should be taken to see that complete power-factor data is incorporated in the machine-tool order.

A Spiral Milling Cutter for Side Rods

By Frank A. Stanley

The milling cutter illustrated is of interest as showing a very coarse-pitch type combined with an unusually steep angle of helix, particularly in the case of a cutter of such small diameter. Furthermore, the length of cutter face as compared with its diameter is unusual. The cutter was made at the Southern Pacific shops at Sacramento, Calif., and is regularly used there for milling out the forked ends of locomotive side rods.

The cutter is shown in operation in Fig. 1 on a horizontal milling machine, the view being from the rear

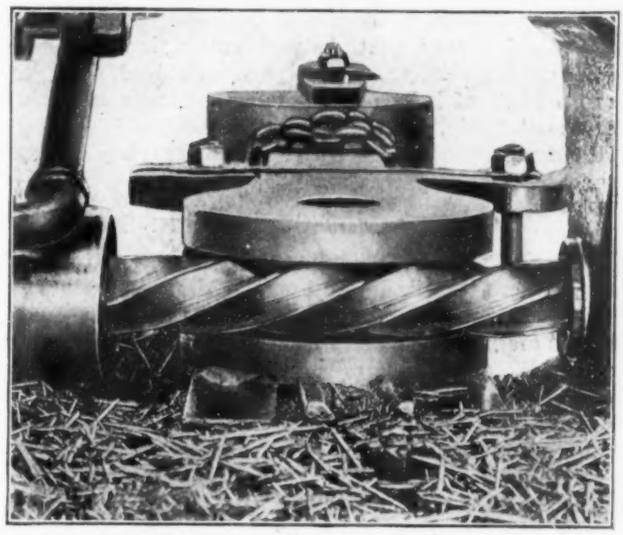


FIG. 1. MILLING FORK IN SOLID ROD END

of the housing to show distinctly the character of the work and the form of the chips removed. A 2-in. high-speed steel cutter is here shown in operation, and details of this tool and also of a 2½-in. cutter are given in the drawing, Fig. 2. The detail at the top of the same drawing shows the method of supporting and driving the cutter in the machine.

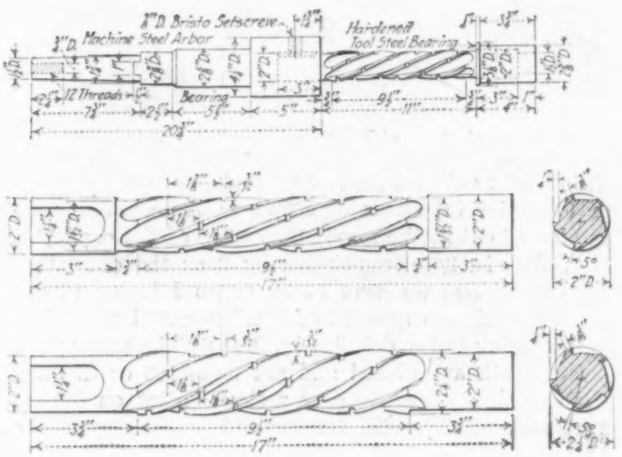


FIG. 2. CUTTER DETAILS

A sketch of the side rod, giving general dimensions, is reproduced in Fig. 3. The work is openhearth forged steel with the forked end to be milled out of the solid to a distance of 9½ in. The greatest width of cut is 8 in. at the diameter of the round end.

With so wide a cut and such a small diameter of cutter, a coarse-pitch tooth is essential to aid in clearing out the chips, so the cutter shown is provided with five teeth

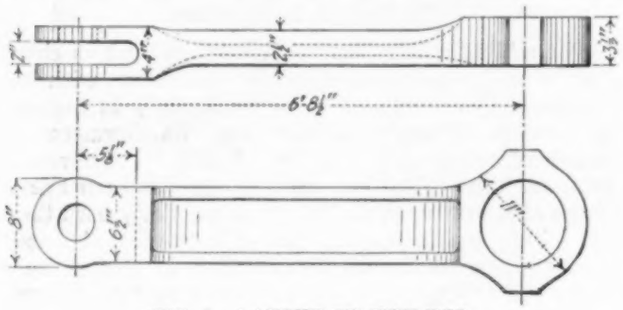


FIG. 3. LAYOUT OF SIDE ROD

only which gives a width between cutting lands of nearly 1¼ in. This liberal chip space combined with the sharp angle of helix allows the cutter teeth to roll the chips out freely, and the action of the cutter is naturally very free, owing to the pronounced shearing effect of each tooth as it passes across the work.

A Layout of the Cutter-Tooth Slope

The diagram, Fig. 4, is a layout of the cutter-tooth slope where the circumference, 6.283 in., represents the height of the rectangle and the lead of 12 in., the length of the diagram. The sloping line from corner to corner shows the true angle of spiral as taken, of course, at the top of the tooth. This angle is computed by dividing 6.283 by 12 which equals 0.5236 and this is the tangent of 27 deg. 38 minutes.

The fork is milled out in one cut from the solid; therefore, the feed cannot be crowded too hard, especially in view of the width of surface operated on and the slender proportions of the cutter itself. Still the feed is ¾ in. per minute and the speed of the cutter is 148 turns per minute, or about 77 ft. surface speed.

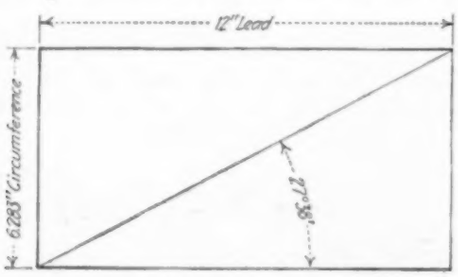


FIG. 4. DIAGRAM OF CUTTER HELIX

This works out at a feed of 0.005 in. per turn of cutter, or 0.001 in. thickness of chip per tooth. Taking the section of cut at the maximum width of the connecting-rod; that is, 8 in. multiplied by 2 or the diameter of the cutter, and we have 16 in. times ¾ in. or 12 cu.in. as the maximum amount of steel removed per minute.

Referring to the detail, Fig. 2, it will be seen that the cutter teeth are nicked and are undercut or hooked to the extent of 5 deg. to give a clean "bite" on the work surface, and thus still further aid in the shearing out of a smooth chip and the production of a clean, smooth surface in the sides of the forked opening in the work.

The Status of the School Shop

By George Heald

On page 650, Vol. 51 of *American Machinist*, J. B. Phillips, after commenting on the statements of W. O. Forbes on page 122 of the same volume, asks the questions, "Should time allowance be made for school-shop work?" "If so, how much?" and "Who shall define the requirements?"

It seems to me that the question of time allowance would be applicable only to the few shops that still have some kind of an apprenticeship system, and that there should be some form of agreement between those shops and the schools.

In one city the manufacturers, after visiting the schools, agreed in conference with the school authorities to allow the school graduates the full two years they had been in the school and start them in their shops as third-year apprentices. This constitutes quite an incentive to a boy to finish his two-year school course.

We will all agree that a school-shop graduate should be able to prove his superiority over a boy who has had no industrial training, but unless his training is recognized by the employers, he may get no opportunity to demonstrate his ability. One foreman told me that he would be glad to take school-shop boys, but that they would be obliged to follow the same routine as the other apprentices. Such a course of procedure might result in the lapse of considerable time before the school graduate would be permitted to do work that required any degree of skill.

If this foreman's attitude reflected the general opinion it would seem to be a waste of time for a boy to enter a vocational school, but most of us who have had something to do with the training of boys in the school shop know that such boys are worth considerably more to an employer than one who has had no industrial training.

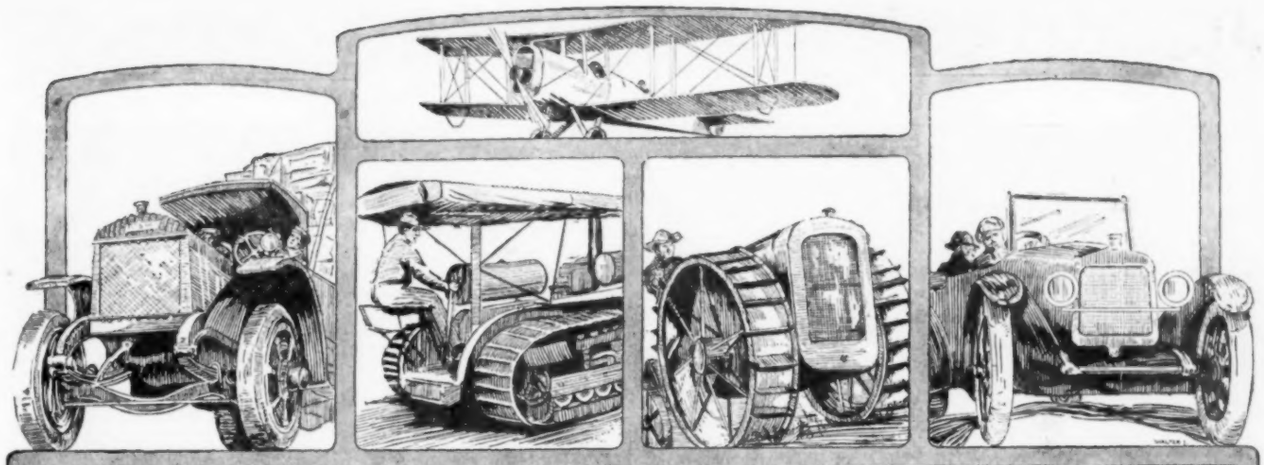
I believe that the definition of requirements asked for by Mr. Phillips should be determined by a joint conference of employing manufacturers and school men, and I think that enough of the manufacturers could be interested to take care of all the graduates, and that the benefit would be mutual.

In highly specialized plants where the tendency is to establish training departments, I do not believe an agreement is necessary. The school-shop graduate will be able to prove his worth and will be ready to take his place in production in a shorter period of time than will the boy who has not had the advantage of such training.

Copper in Rustproof Steel

In a paper read by D. M. Buck before the American Society for Testing Materials, it was brought out that very small amounts of copper have the effect of reducing corrosion in steel. Tests were made of openhearth steel with various copper additions, so that there was from 0.012 to 0.254 per cent of copper in the ingots. These were rolled into sheets and exposed to the atmosphere in the Connellsville coke region, together with a number of pieces in which there was no copper. It was found that a mere trace of copper was sufficient to prevent rapid corrosion.

At the time of the Vienna peace conference in 1815 there was not one steamship on the ocean. In 1914 there were 30,000,000 tons of steam vessels.



AUTOMOTIVE CONSTRUCTION

Finishing Liberty Motor Connecting-Rods

By H. A. CARHART
Mechanical Engineer, Lincoln Motor Co., Detroit

Putting the finishing touches on the forked rod involves a number of interesting problems which are brought out in this article. The utmost care fails to prevent the springing of rods, but the methods of locating and clamping are interesting and suggestive.

THE actual finishing of the Liberty motor connecting-rods may be said to begin with the sawing off of the caps, and the way in which the rods and caps are finished by grinding has many interesting features. The testing and straightening of the rods indicate beyond question that it is impossible to prevent the parts from springing during the machining operations even though the utmost care is used in designing fixtures and in handling the work itself.

In the same way, burring or removing the slight burrs thrown up on the edges and corners from all machine operations is a necessary part of work of this kind, for unless these burrs are removed it is impossible to locate the pieces accurately in the fixture, not to mention the annoyance and danger to the operators.

The bolt holes in both rods and caps are line-reamed so as to insure the bolts going together properly without stress. This final reaming is done with a bit brace and a reamer, 0.3125 in., the holes being tested by plug gages. Care is taken that the hole is properly cleaned of chips and that the bolt is well lubricated before assembling, and a tolerance of only 0.005 in. is allowed. Three men are used on this operation. One man reams and assembles 130 caps and rods in a 9-hr. day.

After grinding the outside of the fork, it is again necessary to be sure that the rods are straight and they are checked in a special fixture to determine if the piston-pin boss is in the proper relation with the forks.

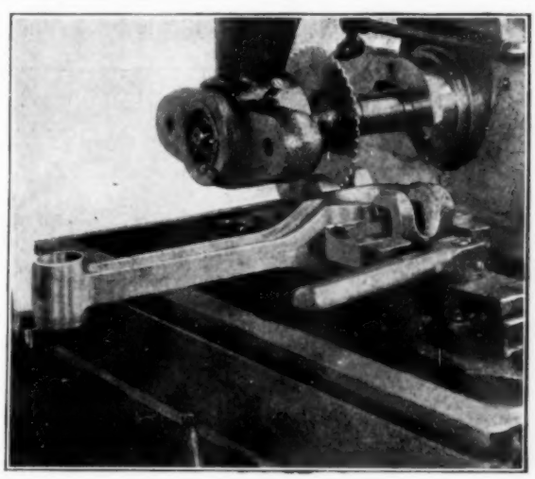


FIG. 1. SAW OFF CAPS

Fig. 1—Caps are sawed from the rod on a 12-in. Cincinnati milling machine; 1-in. arbor; saw, $\frac{1}{8}$ in. thick by 6 in. in diameter. Rod located at end of bolt boss and clamped against outside of boss by claws shown. Rod is turned over after sawing one cap. Cutting speed, 65 ft. per minute; hand feed. Production 400 rods in 9 hr., one man.

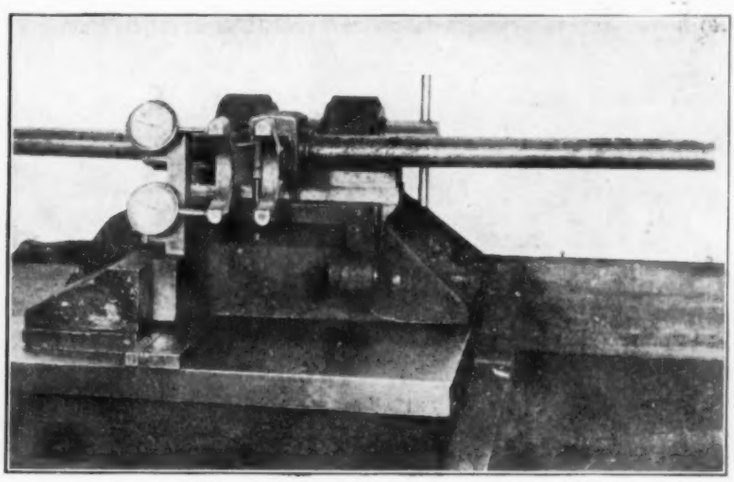


FIG. 2. TEST AND STRAIGHTEN

Fig. 2—Test parallelism of forks with piston-pin boss. Spring as necessary by long bending iron. Rod is trued until it checks with the dial gages, also parallelism of forked end with piston-pin hole. Capacity, 350 rods in 9 hr., 2 men per fixture.

AUTOMOTIVE CONSTRUCTION

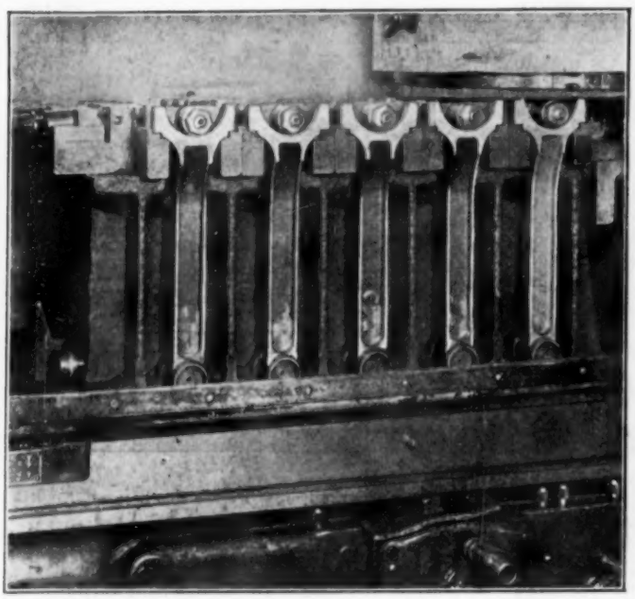


FIG. 3. GRIND JOINT FACE OF ROD AND CAP

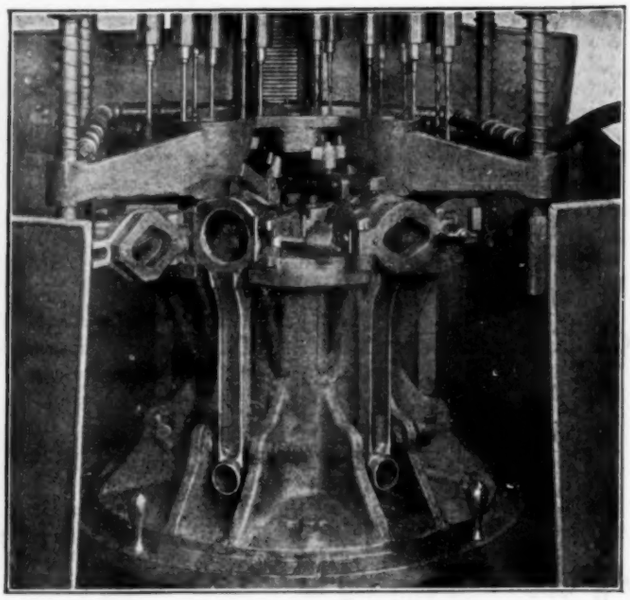


FIG. 4. DRILL AND REAM BOLT HOLES

Fig. 3—Pratt & Whitney 48-in. surface grinding machine; 14 in. by 4¼ by 10¾ Alundum wheel; Grade T; grain, 38 x 24. Five rods on side, one at each end. Located by piston-pin hole and clamp on side fork. Caps located on end of bolt bosses. Wheel speed, 5000 ft. per minute. Production, 350 rods in 9 hr., one man. Fig. 4—Sixteen-spindle Natco drilling machine; eight spindles carry $\frac{5}{8}$-in. high-speed drills, others carry high-speed reamers 0.309 in. Two rods are drilled, two reamed, two mounted and unmounted. Rod located from end of bolt boss and side of fork. Caps and rods held by equalizing clamps on face. Speed, 30 ft. per minute; feed, 0.005 in. per revolution. Production, 250 rods in 9-hr. day, one man.

It was found that the forks have a tendency to change parallelism after being ground. About 50 per cent. of the rods require straightening at this point. One man checks 400 rods in 4½ hr. The over-all width of the fork is 2.4375 in. plus or minus 0.002 in. and the width of the side of the fork is 0.5625 in. plus or minus 0.001 in.

Checking the Piston Hole

After finish-reaming the large and small holes, the piston-pin hole is checked with a plug gage to be sure there is sufficient stock for grinding. The crank-pin bearing hole is also checked for the same purpose.

After the hole in the small end is ground, the dowel hole in the cap is drilled and reamed on a Natco four-spindle drilling machine carrying two $\frac{11}{64}$-in. drills and two 0.187-in. reamers. Rods are located on a pilot with a spacer in the large hole and on a pilot in the piston-pin hole. The cutting speed for this is 50 ft. per minute with hand feed. Production is 450 rods in 9 hours.

Following this is another burring operation over the entire rod. This operation is performed by women who average 70 rods per 9-hr. day.

Washing in Hot Soda

The rods are then washed in a hot soda solution, the washing liquid being contained in a vat heated by steam pipes. This keeps the temperature of the solution at about 200 deg. F. A woman operator using a hook of half-inch steel in the form of a letter S and

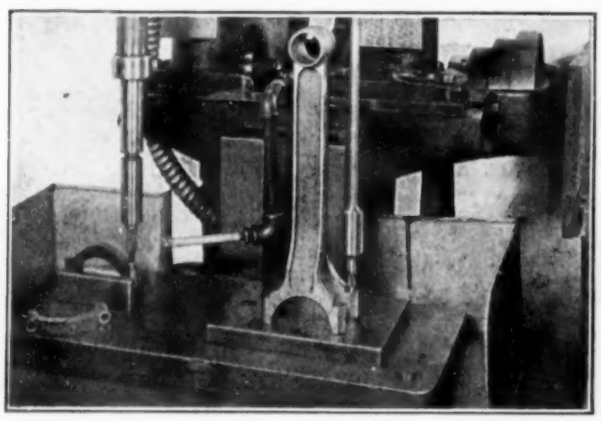


FIG. 5. SPOT-FACE AND COUNTERSINK BOLT HOLES

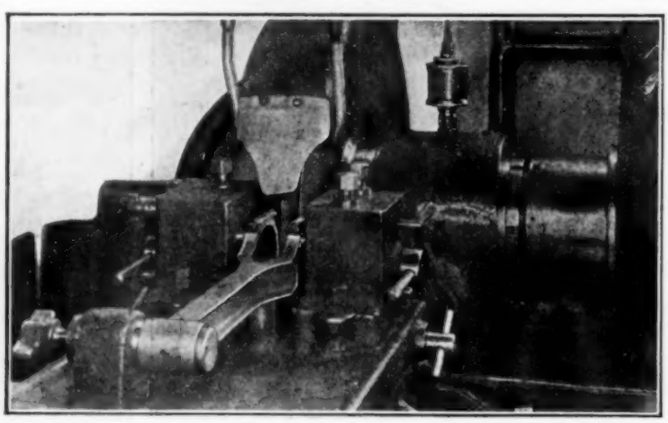


FIG. 6. GRIND INSIDE OF FORK

Fig. 5—Leland-Gifford double-spindle drilling machine; ⅞-in. countersink with 10-in. extension; ⅞-in. spot facer with 0.309-in. pilot in second spindle. Rods and caps placed on steel blocks shown. Cutting speed, 110 ft. per minute; hand feed. Production, 350 rods in 9 hours. Fig. 6—Norton 10 x 36-in. grinding machine; 18 x 1⅝ x 5-in. Alundum wheel; grade M; grain, 38-36. Rod clamped by expansion plug in piston-pin hole, located by buttons against outside of fork. Wheel speeds, 6000 ft. per minute; hand feed. Distance between forks checked with gage 1.3125 in., plus 0.002 in., minus 0.000 in. Production, 150 rods

AUTOMOTIVE CONSTRUCTION

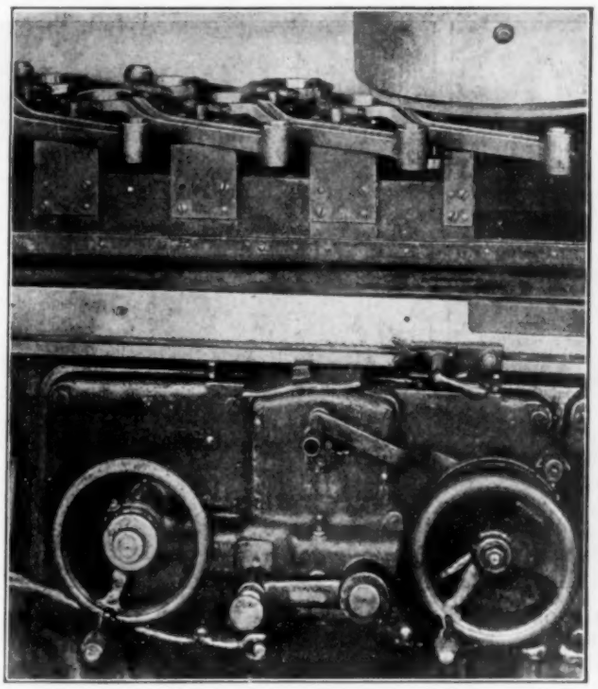


FIG. 7. GRIND OUTSIDE OF FORK

Fig. 7—Pratt & Whitney vertical grinding machine; Alundum cup wheel, 14 x 4 x 10⅜ in.; grade J; grain, 36-38. Eight rods held in fixture, located on hardened buttons inside of fork; equalizing clamp on bolt bosses. Rods reversed for second side. Wheel speed, 5000 ft. per minute. Production, 250 rods in 9 hr., one operator to two machines.

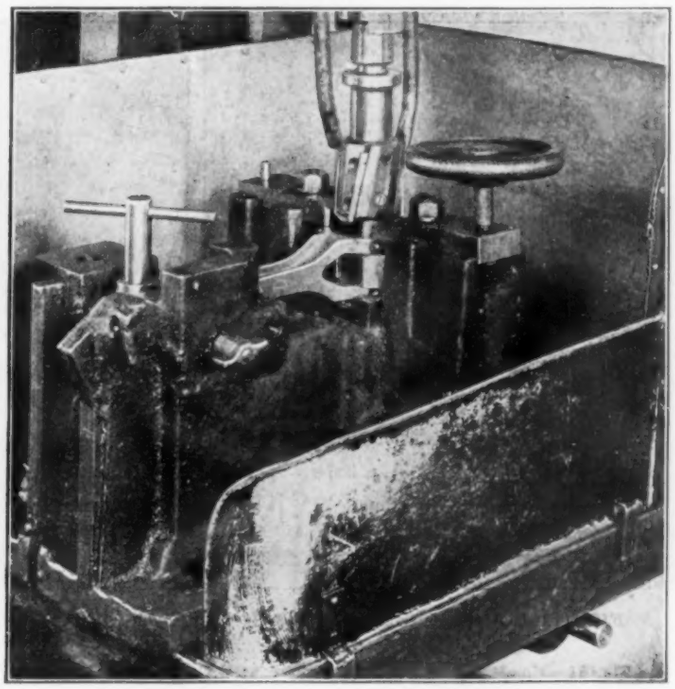


FIG. 8. ROUGH-REAM LARGE HOLE

Fig. 8—No. 310 Baker drilling machine; inserted blade reamer, 2.884 in. Locate rod on pilot in piston-pin hole, spacing washer between forks. Parallel blocks fit against outside of bolt bosses. Cutting speed, 75 ft. per minute; feed, 0.020 in. per revolution. Production, 400 rods in 9 hr., one man.

covered with rubber hose to protect rods from injury does the washing. This hook holds three rods by the large end and they are dipped three or four times in the solution, after which they are allowed to drain and dry. One woman washes 800 rods in 9 hours.

Then comes the final inspection, in which the rods are removed from the boxes and the center of the crank-pin bearing hole is checked with a special gage. The rod is then placed in a fixture to determine if the centers of the holes are in the same plane and paral-

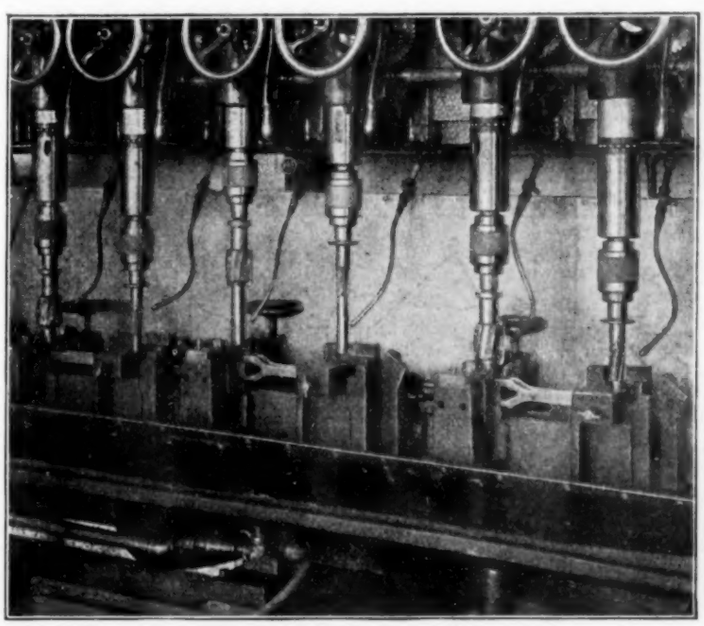


FIG. 9. FINISH-REAM LARGE AND SMALL HOLES

Fig. 9—Eight-spindle Foote-Burt drilling machine; two spindles to fixture; Wiard chucks; reamers, 2.911 in. and 1.422 in. Reamer pilot guided in bushing. Spacer between forks. Located by bolt bosses. Cutting speed, 70 ft. per minute; feed, 0.009 in. per revolution. Production, 350 rods in 9 hr., two men.

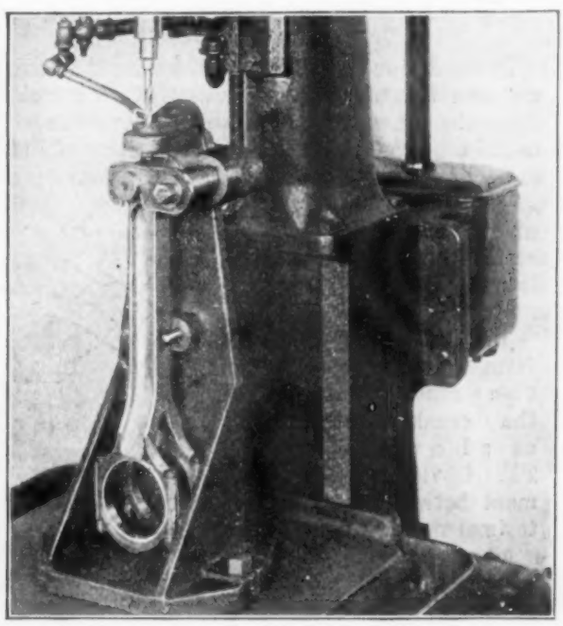


FIG. 10. DRILL OIL HOLE PISTON-PIN END

Fig. 10—Sipp drilling machine; $\frac{5}{16}$-in. taper shank drill. Locate on pilot in piston-pin hole, held by pins against side of rod. Cutting speed, 50 ft. per minute; hand feed. Production, 200 per hour.

AUTOMOTIVE CONSTRUCTION

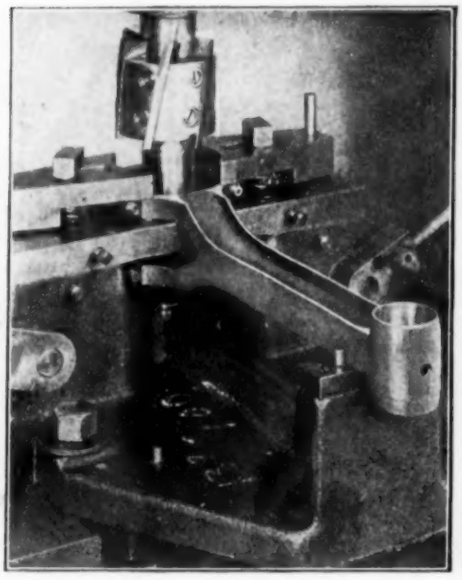


FIG. 11. COUNTERBORE RECESS IN LARGE END

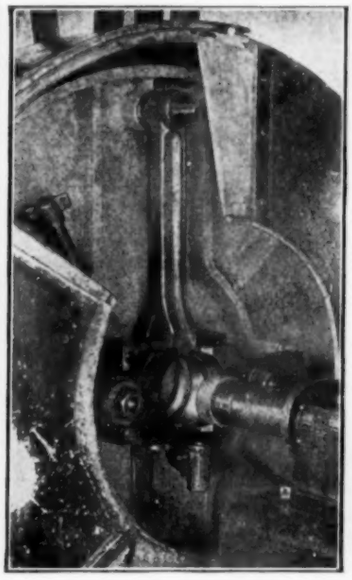


FIG. 12. GRIND HOLE IN LARGE END

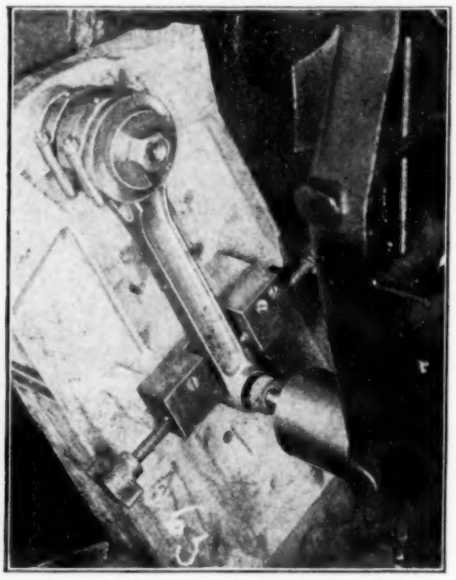


FIG. 13. GRIND HOLE IN SMALL END

Fig. 11—No. 310 Baker drilling machine; counterbore, 3.120 in. Rod located by plug in large hole, clamped on large end. Rod reversed for second cut. Cutting speed, 80 ft. per minute; hand feed. Production, 400 rods in 9 hr. Gaged from inside of fork. Fig. 12—No. 70 Heald grinding machine; 2½ x ⅜ x 7-in. Alundum wheel; grade K; grain, 60. Rod located in revolving fixture by plug acting as pilot to centralize before clamping. Crank-pin bearing hole, 2.9375 in. plus or minus 0.00025 in. Spindle speed, 9200 r.p.m.; wheel speed, 4000 ft. per minute. Production, 100 rods in 9 hours. Fig. 13—No. 18 Bryant grinding machine; Alundum No. 38 wheel, grade K; grain, 60. Rod located by pilot through large hole, spacer between forks when clamping. Piston-pin bearing hole, 1.4375 in. plus or minus 0.005 in. Wheel speed, 350 ft. per minute; fixture speed, 350 r.p.m. Production, 100 rods.

lel. This fixture also checks the piston-pin boss for alignment with the outside and inside faces of the forked end.

Bell Cranks for Transmission of Uniform Motion

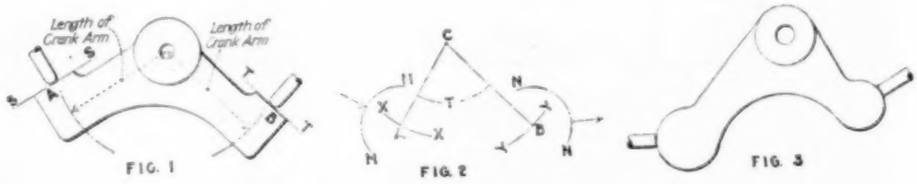
BY JOSEPH J. SULLIVAN

In the design of bell-crank levers for the accurate and uniform transmission of motion in an angular direction, where a system of tappets or contact surfaces are used instead of the conventional practice of linkage, we are confronted with the problem of designing a system of contact surfaces that will give a movement at least as accurate as would be obtained were the parts connected by links.

In Fig. 1 is shown a form much used, in which the contact surfaces of the crank are straight, as shown at *SS* and *TT*. Obviously, this crank gives uniform movement between mover and moved parts at an infinitesimal movement of the crank only, for as the movement at *A* is applied to the crank and the latter takes up a curvilinear motion about the fulcrum, the point of contact at *A* changes and assumes rectilinear motion in reference to *SS*. Of course the same condition arises at *B*. This, as is plain to see, will cause the lever arms of the crank to change, therefore making the movement inaccurate; for unless the distances from the points of contact *A* and *B* to points on the imaginary arcs scribed by a radius equal to the length of the lever arms remain a constant, the crank arms will not remain a constant. The problem then is to design a bell crank that gives this feature of an unvarying length of crank arms.

In Fig. 3 is shown such a design. It is laid out in the following manner:

From center *C*, Fig. 2, with a radius equal to the desired length of the crank arm, we scribe the arc *XX*. From this same center, with a radius equal to length of other crank arm, we scribe the arc *YY*. From *C*, we lay off lines *CA* and *CB*, with *T* equal to the angle of the crank arms. With *A* and *B* as centers, and any radius desired, we scribe arcs *MM* and *NN*, representing the contact surfaces. As can be plainly seen, any point on *MM* or *NN* will always remain equidistant from *A* and *B*, and as *A* and *B* always remain in their respective arcs centered at *C*, the length of lever arm of crank, therefore, always remains a constant.



FIGS. 1 TO 3. LAYOUT OF BELL-CRANK

Of nearly 9,000,000 men between the ages of 21 and 31 registered in the first draft, 2,721,792 were engaged in manufacturing and mechanical industries. Some of the other classifications were: transportation, 953,062; trade, 618,331; extraction of minerals, 284,456; professional service, 255,572.

Some Tools Used in Making the Keyboard of a Composing Machine

By S. A. HAND
Associate Editor, *American Machinist*

In perfecting intricate machines it is sometimes advisable to have the parts machined by the use of jigs so that when minor changes are made in existing parts, or new parts are made, there may be certainty that they can be assembled with the minimum amount of fitting. This is especially desirable where new parts performing one function may need to be assembled alongside of, or in conjunction with, old parts performing another function. The tools illustrated and described in this article were designed for making parts of a machine that is well past the experimental stage but is still subject to improvements as a manufacturing proposition, and their purpose is to obtain accurate and interchangeable work rather than that of a productive character.

A LINE-CASTING machine similar in its product to the well-known linotype is being constructed by the Electric Compositor Co., Bridgeport, Conn., and the tools here illustrated have been made for getting out parts of the keyboard for the first machine.

Fig. 1 is a general view of the keyboard. It is built up of several parts, two of which must accommodate in one way or another the 128 keys necessary to operate the machine. The top plate *A*, Fig. 2, has 128 perforations punched in it. These are arranged in 16 rows, each row containing eight staggered perforations. The punch and die are made to punch one row at a time so that it requires 16 strokes of the punching machine to complete the work which is accomplished in the following manner:

With the die *B* and the punch *C* set in the punching machine, the plate *A* is placed on the carriage *D* where it is confined by suitable stops and clamps. With the carriage at the end of its travel and the index pin *E* in one of the end holes *G*, the punch will perforate the first row. Succeeding rows are punched by moving the carriage until the index pin drops into the next hole. The punch is made up in eight sections, so that in case of the breakage of one section it can be replaced with another at a comparatively small expense. The die is made in two parts, the dividing line being at the holes.

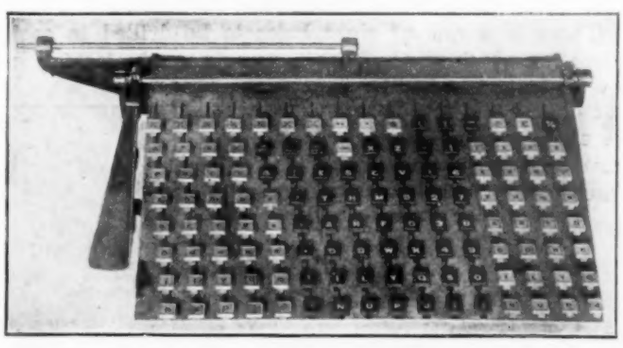


FIG. 1. THE KEYBOARD

By this means of construction, any warping that may take place in hardening can be corrected by grinding and all the holes can be made of uniform size by the same process. At *H* is shown the stripper, which needs no description.

The fulcrum block for the keys *A*, Fig. 3, has 128 transverse and eight longitudinal slots milled in it by means of the gangs of cutters shown at *B* and *C*. To accurately space 128 cutters on one arbor and have the whole gang run true takes a high order of workmanship.

The sides of the keyboard which give it the proper angle of inclination and also support the perforated

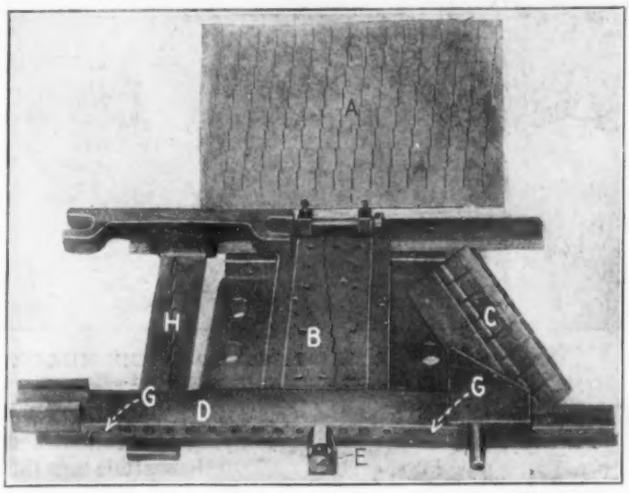


FIG. 2. PERFORATING TOOLS FOR THE TOP PLATE

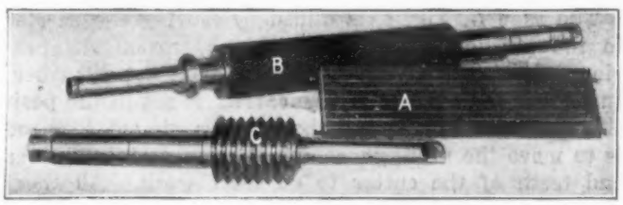
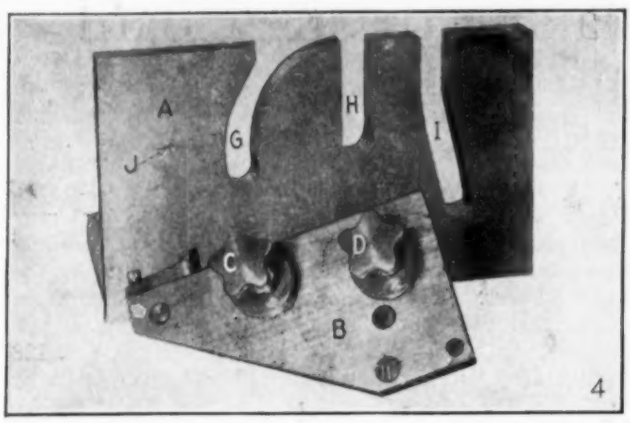
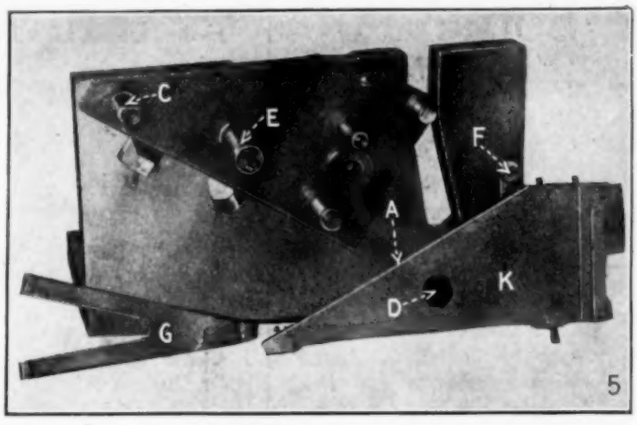


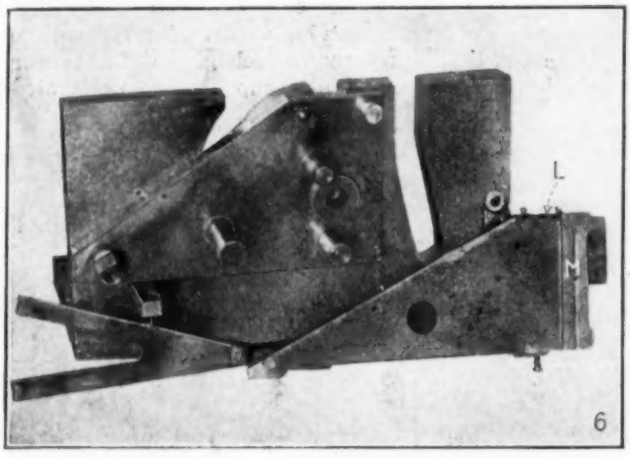
FIG. 3. GANGS OF CUTTERS AND THEIR PRODUCT

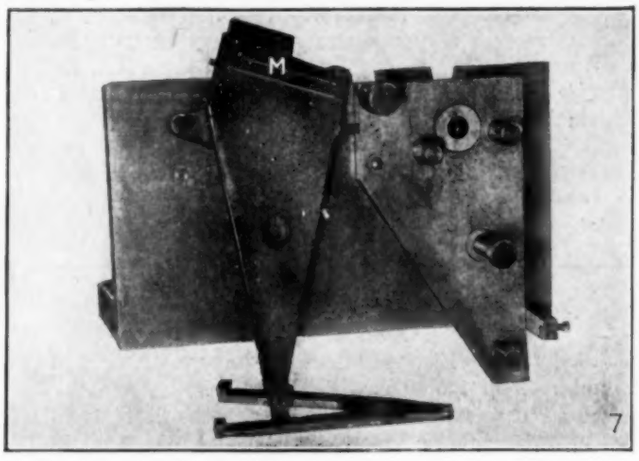
plate and the fulcrum block undergo several milling and drilling operations, for which only two fixtures and one jig are required. The milling fixture, Fig. 4, consists of a peculiarly slotted angle plate *A* and a work holder *B*, provided with clamping studs *C* and *D* so spaced as to enter either of the slots *G*, *H* or *I*. On the other side of the plate are some locating studs, a stop and a gage for setting the milling cutter.

For milling the surface *A* of the work *K*, Fig. 5, the work carrier is set as shown in the illustration where it is located by one of the clamping studs resting against the bottom of the center slot in the angle plate, and a stop pin placed in the hole *J*, Fig. 4. The cutter is set for height by the flat on the stud *C*, Fig. 5, and the work is mounted on the carrier and clamped in place. The hole *D* in the work passes over the stud *E* and the clamp *G* is applied so that the head of stud *E* catches









FIGS. 4 TO 7. THE MILLING FIXTURE FOR SIDE PLATES

Fig. 4—Fixture and work carrier. Fig. 5—Carrier positioned for first operation. Fig. 6—Carrier positioned for second operation. Fig. 7—Carrier positioned for last operation.

the inside edges of the fork. Clamping is accomplished by a hand nut in the rear. The other studs on the carrier are contacts against which the work rests. They also act as distance blocks to prevent the offset lug *F* from resting against the carrier.

The edge *L*, Fig. 6, is milled by moving the carrier to the position shown. For this operation the previous adjustment of the milling cutter is not disturbed. In milling the surface *M*, the carrier is set in the position shown in Fig. 7; and the only adjustment required is to move the milling-machine slide so as to allow the end teeth of the cutter to do their work. All these changes are made without unclamping the work from or disturbing its location on the carrier. As there are two pieces of work to be made, a right and a left hand, two fixtures of the type described are required.

After the milling operations have been completed, several holes are to be drilled through the sides and in the edges of both pieces. For this purpose the jig shown in Fig. 8 was designed to accommodate both a right- and a left-hand piece of the work. In operation these pieces are placed one on each side of the central portion where they are held by suitable stops and clamps. The two side bushing plates are then applied.

As shown in the illustration, the jig is in position for drilling holes through the bushings *A*. For drilling the holes through the bushings *B*, the jig is removed from the inclined block *C* and the surface *D* allowed to rest on the table of the drilling machine. For drilling the holes at *E* the jig is turned on its side with the feet *G* resting on the table of the drilling machine.

There is a row of eight holes to be drilled in each piece for which all the bushings could not be located in

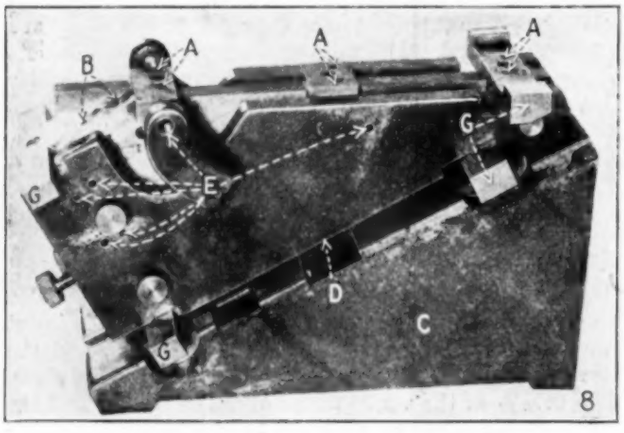


FIG. 8. THE JIG ASSEMBLED

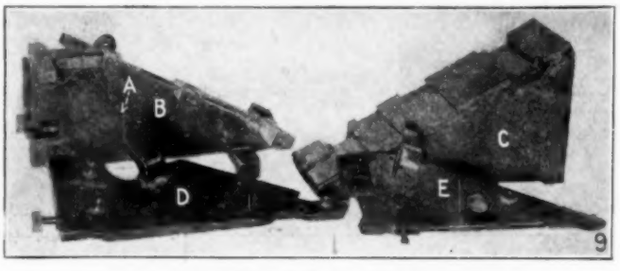


FIG. 9. THE JIG PARTS AND THE WORK

the bushing plates, owing to clearances that were necessary to avoid interferences with offset lugs on the work.

To accomplish the drilling of these holes, bushings were located in the central web of the jig at *A*, Fig. 9. In drilling the holes the work and bushing plate were removed from one side and the jig turned over, being supported by the feet *G*, Fig. 8. As the jig was provided with feet on both sides it was only necessary to reverse the operation in order to drill the row of holes in the other piece. Fig. 9 shows the jig *B* separated from the inclined block *C* and with one bushing plate *D* removed. One of the completed pieces of work may be seen at *E*, in which the row of eight holes referred to is visible.

Industrial Conditions in Japan

By MARSHALL J. ROOT
Vice President, the Fairbanks Co., New York

Japan is in a splendid position to develop its manufacturing in machinery and other lines. The war left Japan with no great excess of armed forces over peace time, and consequently no great increase in taxes as is the case with other belligerent nations. The greatest pinch is that the armistice left her with considerable pig iron and steel on hand, for which she has paid war prices as high as $35 a ton for pig iron and $900 a ton for steel. Pre-war prices were about 15 to 20 per cent of this.

THE inability of Japan and the Far East to procure machine tools from Europe and the United States during the period of the war, especially after the United States became involved, forced her to very largely increase her manufacturing facilities as well as to utilize to the fullest extent her railroad and other government shops, the outcome being that some very large plants for the building of machine tools of various kinds have been developed in the past five years.

Quantity production is, of course, unknown, and the shops of necessity make any kind of machine ordered. Much of the shop equipment had to be built in Japan, with few facilities and few mechanics skilled in this kind of work, and the shop owners and managers realize that the machines are not first class, especially for a shop building other machine tools.

New Machinery Wanted

Several of these shops expect to relegate many of their present machines to the scrap heap and to purchase new equipment, presumably in the United States. They are also considering the engaging of engineers and production managers to help in putting their shops on a good working basis. Production at the present time is very low as compared with shops in the United States. They use practically no jigs or fixtures, and the output per man is necessarily low.

Foundries are particularly bad, both as to quality and quantity of castings turned out. Except in the larger establishments, such as the shipbuilders, government shops, etc., which employ chemists in their laboratories, very little attention is paid to the mixture, with the usual result of such neglect.

The larger machine-tool builders have in most instances very modern equipment as to the handling of their products, such as overhead cranes, etc., but are woefully lacking in modern methods and equipment for accurate production. On the other hand, due to the abnormal price paid for machine tools during the war, most of the machine works are in a very strong financial position. They are planning to develop their plants into real manufacturing establishments as fast as the market warrants—and this means not only the markets of Japan but of China and of Siberia.

One weakness which they must and will overcome is the failure to have their sons who take the technical courses, get practical experience in the shop. This is a remnant of the caste system, which is fast disappearing in some places, and which cannot last long.

Our weakness in Japanese trade, as in all our foreign

business, is in not being well represented, in not studying the field and the customs of the country, and in the matter of credit. As a result, we have supplied approximately but 25 per cent to 35 per cent of the machine tools in Japan, while Europe has supplied the rest. We do not take time to get the point of view or in fact that of the people of any other country, nor to find out wherein their customs, ideas, and standards of business differ from our own.

There are machinery houses in both Japan and China that cover the country with experienced salesmen who know conditions thoroughly. At present, there is a strained relation between Japan and China, and this prejudice may throw many orders to the United States for the time being. But if Japan gets into the machine-tool business in earnest and can sell machines cheaper than we can, the dollar is apt to be the deciding factor.

The average mechanics in machine shops receive a

wage of 60 cents per day of 12 hours' work, whereas the laborers, a great many of whom are women, receive 30 to 35 cents a day. The output of the individual is about 20 per cent to 25 per cent of that in our American machine shops, but this factor will not be maintained forever and the probability of cheap labor for some years to come would make it seem advisable for manufacturers of some articles to establish themselves in Japan and manufacture there for the Far East, instead of attempting to supply these markets from home. Capital for such enterprises is said to be available in most parts of Japan where factories would be liable to be started.

The Japanese worker is more versatile than the Chinese. The latter can be well trained for one operation or one job, but having learned one job, he seems almost incapable of forgetting enough of the first job to learn how to do another.

Not being manufacturing countries, plain machines, capable of a variety of work, are most likely to be in demand for a long time to come. And, as machines of this kind can be most easily made the Japanese are very likely to increase the output of their shops and in this way decrease imports from the United States and other countries.

The talk of establishing an automobile industry of which we sometimes hear considerable, seems to be built on slight foundation, owing to the lack of streets or bridges suitable for motor traffic. The thoroughfares usually have no sidewalks, compelling pedestrians to use the street itself. The drainage is at the side, in gutters at least a foot deep, and if a motor vehicle drops a wheel into one of these gutters it is in difficulty. Then, too, many of the streets and roads are barely wide enough for two cars to pass.

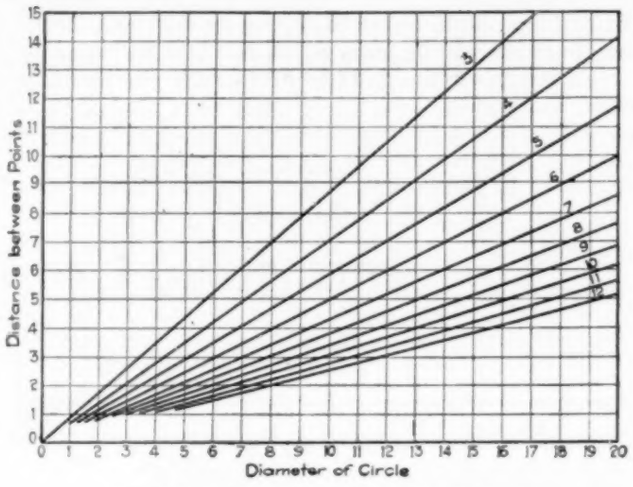
Just as an example of the difficulties of motor traffic, I may mention a ride from Tokio to Yokohama, a distance of only 18 miles. The whole trip was a problem of working one's way through a mass of pedestrians, jinrikishas, and coolie carts, and required 2½ hours.

In closing, let me add, having been in Japan, I have little fear of the so-called "yellow peril," and if trouble does arrive it will be brought about principally by our yellow journals. The ruling class of Japan dominate all policies in their entirety and they are an extremely small percentage of the total population of sixty millions, possibly two or three per cent. Of this class, fully 90 per cent are decidedly pro-American and are very highly educated. Most of them have visited America and are aware of the potential strength within our boundaries. Furthermore, Japan has a number of very shrewd politicians and they realize that their best interests lie in friendship with the United States. However, as competitors in the industrial field in years to come, we must not overlook this small nation and their wonderful industry and ability to succeed.

Chart for Locating Equidistant Points on a Circle

BY SIDNEY K. EASTWOOD

The problem of determining the proper spacing of any given number of points to be laid out on a circle at equal distances, occurs in the shop or drawing room whenever a pipe flange or cylinder head is to be drilled and in many other cases. Its solution involves considerable calculation or a resort to geometrical means. To eliminate this work the accompanying chart has been devised which will give the corresponding chordal spacing in decimals of an inch, for from three to twelve equally spaced points corresponding to any given diameter.



CHORDAL DISTANCE SPACING CHART

The chart consists of a series of lines numbered to correspond to the required number of divisions. These lines are plotted with the given diameters at the bottom and the resultant spacings at the left of the chart. To determine the spacing necessary to give a required number of equidistant points, consider a perpendicular erected from the bottom of the chart at a point corresponding to the given diameter to the line corresponding to the number of divisions required. The height of this perpendicular which is read at the left is the required distance between the points to be laid off on the circle. As this distance is given in decimals, it is necessary to convert it to units and fractions thereof if the scale available for laying out the work is in feet and inches This can be readily done with a table of decimal equivalents. If a hundredth scale is available the chart gives the result direct.

Zinc Production in Australia

One of the metals of which the Germans had obtained control before the war was zinc. That control, such as it was, was due to the arrangements made by the German metallurgical organizations with the producers of zinc in Australia, the supplies of the zinc concentrates obtained from that source annually representing the equivalent of 200,000 tons of the metal. The technical difficulties in the way of recovering the metal from the highly complex Australian ores were too great to make the production of the metal in the Commonwealth feasible at the time; while British metallurgists were not prepared to attempt the task. Hence the field was left to the Germans. It would appear from a report recently presented to the Commonwealth government by the Electrolytic Zinc Corporation of Australia, that there is little likelihood that Australia will ever again lose the control of the production of zinc from her ores. Electrolytic methods of zinc recovery in the United States and Canada has led to the introduction of that process. The output of zinc has now reached about 25,000 lb. per day, the metal having a purity of 99.9 per cent.—*Brass World.*

Locating a General Machine Shop

By L. W. ALWYN-SCHMIDT

This article tells of the subdividing of the machine-building industry into smaller specializing machine shops, these selling their services to other bigger shops. The problem of the location of these machine-shop subdivisions, regarding labor, renting, hauling, shipping and new work facilities, is described in detail.

THE American machine-building industry is running into a period of intense division of labor. Only by such a policy can it be hoped to overcome the handicap of rising wages and high cost of material. Some machine shops specialize in making certain small parts of machines; while others manufacture and assemble parts comprising different units, the whole being completed in a large machine-construction shop. These different organizations may be parts of one big organization having shops in different localities, as is the case today with the automobile industry. The next few years will see a rapid growth in the number of the machine shops of this country, all selling their services to other bigger shops for which they make special parts under contract. Such a division of labor, which is not at all new to our country but has not been tried as yet on so large a scale, will be of considerable benefit to the industry as a whole. It will permit the more intimate equipment of a machine shop just for the kind of work it sets out to do. It will make possible a better selection of the labor force, and will bring in the reach of every machine builder a highly efficient establishment which he can engage by simply giving his contracts to the shop that has assembled a perfect organization.

But the higher the specialization of each shop, the more difficult it will be for the individual enterprise to select a suitable location, meaning one where it can find the sort of jobs for which it was equipped and where it can prosper.

There have been many sins against our industry in former years in the matter of location. General machine shops, especially, have often been placed in localities which, owing to their special character, could offer little real attraction to other industries likely to be interested in their services. In such cases the personal likings and dislikings of the shop owner have often been the deciding factor for the choice of the location, while the business prospect of the enterprise should have been predominant. Often machine shops have remained in localities after the real cause for their organization had ceased to exist. Some of these shops are still making out very well. The great majority, however, are unfortunately destined to fail. Bad location, in fact, is responsible for many of the machine-shop failures of recent years.

The situation at the present requires especial care, as the great industrial activity of the war has caused an expansion of the machine industry in many localities which are not well suited for such a purpose. A good example is offered by many of our Eastern cities which now have large machine works that were built during the war, either because their organizers thought that labor was cheap in the district or that a vacant lot could be had for a reasonable price. If these enterprises should have attracted also supplementary industries to the neighborhood, as, for instance, general machine shops, they would be bound to suffer after the closing down of the principal enterprise. They would lose their leading customer or all those customers which were called to the district by the existence of the large enterprise and the end would be the going of a number, if not all, of these shops unless new work could be found for them.

While in this way a reduction will take place in the number of machine shops in certain localities, the reorganization which is now under way is bound to cause a demand for the services of the general and specialized machine shops in many neighborhoods which have not attracted much attention during the war. The very existence of peace will change the character of the industrial life of many cities. It must have a powerful effect upon the large industrial enterprises located within their limits, necessitating a thorough reorganization of the supplementary industries. The problem of location for a machine shop, therefore, arises just now in two distinct forms: in the instance of many large shops, it is the problem of relocation; in that of others, the search for a suitable location for an entirely new enterprise.

Relocation is always more difficult than placing an entirely new enterprise. The machine-shop owner, who for one or the other reasons is compelled to relocate his plant, already owns a complete industrial equipment which he must move. This equipment may be either of a general character, or it may have been installed for a special purpose. A general machine shop can easily turn from one job to the other. If a large contract is lost in the neighborhood, there is still the possibility of taking other local work.

General repair work and similar jobs can mostly be had in any neighborhood. To relocate a machine shop equipped for general work is comparatively an easy matter. All that is wanted is a neighborhood where much general machine work is done. If the shop, however, should be one doing special work with a machine equipment made for this particular work, the selection of a new location may be more difficult. It means that a district must be found which has a great number of works requiring the special services of the shop, and such districts are not always easily spotted. The transfer as a rule is complicated by the necessity of moving, not only the equipment but also the staff.

Entirely new shops find it much easier to settle. They are mostly the outcome of local demand and organized by local interests. They will locate, therefore, in their own district and will be equipped in a manner most likely to appeal to the customers of that district.

In the following a few of the principles will be discussed which should determine the location of a modern machine shop. Care will be taken to differentiate between the case of the shop under the necessity of relocating and the new enterprise.

It should be stated beforehand that the selection of factory sites for any industry is a science which is carefully studied by experts in the real estate and factory-property field and which has made especially rapid progress in Europe. Industrial real estate is now most carefully valued by the purchasers and, in the case of extensive properties, an investigation is made not only in the financial value of the property but also

in its economic value for the prospective purchaser. A continental European firm, for instance, which had to locate an industrial plant in England, had the whole question studied for more than a year before a property was decided upon. When, after the outbreak of the war, this property was taken over by the government for the manufacture of war material, it was pointed out in the press that it was because the excellent location of the enterprise made it a perfect factory unit in every respect.

Returning to the case of locating a general machine shop, the following may be suggested to the intending buyer or lessee of any property or location:

Professional locators of industrial real estate are accustomed to speak of the local and the national suitability of a prospective location. Many factory sites are offering both the advantages of local and national suitability, while others may be favored only as to one of the two.

Picking a Location for a Machine Shop

If a machine shop should be located in a city like New York, the national suitability question will arise only rarely. These shops work nearly all exclusively for New York. However, the suitability of the local situation may often be under suspicion. Generally speaking, New York machine shops do not trouble very much about their location. They pick it, if possible, in a neighborhood where rents are cheap and where power can be easily obtained, but they also consider all the other factors that make for a suitable location for a machine shop. Let us imagine a medium-sized machine shop in a city like New York. For this shop there would not be the need to arrange for a location offering exceptional facilities as to the proximity to its most prominent customers. These customers will be distributed all over New York. Owing to the excellent traffic conditions in this city it is possible to reach each of these in a short time. It may be more difficult, however, to deliver the manufactured goods. Haulage in a city like New York is a very expensive matter, and there are instances where it will cost less to ship a certain shipment on a sea voyage than from one part of New York to another. So if a machine shop should locate too far away from its consumers, other shops more favorably situated would secure the business on the strength of being able to deliver more cheaply.

The same case may arise in any other of our large cities where conditions are analogous to those existing in New York. The more recent development of our modern cities has led to an increasing specialization in certain districts. There are great districts holding practically nothing else but millinery factories; while in others, printers, tailors, furniture makers, and, incidentally, also machine shops of all kinds, may be found. Each of these districts, as a rule, is the result of careful city development which has seen to it that these localities contain all that is required to make a good home for a machine shop. One of the advantages of this system is the facilitation of intercourse between the individual enterprises. The principal gain, however, is that labor is attracted more easily to these districts. Tramways can be built, carrying the men to and from the shops, and residential quarters can be provided for.

The problem of local accessibility arises less often in medium and small cities where distances are not great and where men can walk to their work more conveniently than in a big city. But small cities are often lacking other advantages for the location of a machine shop of which the foremost is the smaller supply of trained labor.

A good supply of labor is essential for the local development of any industry. A medium-sized city rarely collects a sufficiently large surplus of labor in any particular branch of industry so as to offer a solid guarantee for a permanent supply. While relocating a plant in a medium-sized or small city, it is therefore necessary to look at first very closely into the labor situation. It may be necessary to bring the operatives of the former plant along, which in turn assumes that the new location offers living accommodation for an influx of labor.

Such medium-sized cities may be understood to have between 80,000 to 150,000 inhabitants and a comparatively small number of well-equipped general machine shops may be able to do all the work necessary for the immediate needs of the neighborhood. Of course, there are many cities which take an exceptional position in this respect; cities where the iron and steel industry or the manufacture of articles from iron and steel is at home. We have many such cities in the United States, where the population is composed largely of industrial workers. In such cities, a generation of iron and steel workers trained thoroughly in the particular specialty of their city grows up, and from the workers employers arise who settle in the neighborhood with new industrial enterprises. Such a city rarely sees a rebound in its prosperity. It has no industrial boom, but grows by reason of its own strength. Localities like these are ideal ones to locate in either under a scheme of relocation or for a new enterprise.

The usefulness of the services of a general machine shop to its customers is determined largely by the price by which this shop can supply the ready product to his customer. Take two machine shops, one located in A, and the other located in B, both having a prospective customer in C. It is clear that the shop which has the cheapest means of reaching C, both for getting and delivering the order, is favored in every respect, unless one of the two shops has special means of making its services more effective, as cheaper labor, lower overhead expense, or better class of production. Each of the three factors in favor of one or the other competitors may be a matter of location. It stands to reason that the most favored competitor will not win out only in the matter of gaining the trade of C but also will withstand better the general competition of the market with the ultimate chance for future prosperity.

Selecting Location by a Map

Take a map showing the city which you think offers special facilities for a location. Mark your city and make it the center of a circle including the most promising cities of the neighborhood, cities where you expect business. Now, pick the competing location in the same region and repeat the process. This will show where and how the different localities overlap and what competition you may expect. But competitive ability depends not always upon distance. A longer distance may be often outweighed by the possibility of having more trains or cheaper freight rates. So, before making the decision, it is a wise proceeding to study also the number of passenger and freight trains operated to and from the location and the number of mails that are available.

If two cities should prove equal on the basis of the general location test, the supply and permanency of labor should be gone into. It must be assumed that a new shop will be attracted by a demand for additional machine-shop service, which means that the existing shops cannot do all the work required by the district. This may result from a lack of equipment but it results much more often from a lack of help. This, at least,

is one of the primary causes just now. In the case of a new enterprise, it may be possible to attract outside help which may come from nearby cities having a surplus. It has been found of value in such instances to study the labor conditions in related industries. Nearly all cities having a large industrial population have a certain percentage of floating labor belonging to different industries. To take up this surplus when it appears in the market and train it for the special work of the new shop has been tried successfully by many employment managers and may prove of help also in the case of a new establishment.

Rent and taxes play an increasing part in the budgets of machine shops. To evade the high rents of one locality has become a frequent motive for relocation of industrial enterprises. With the rent situation as it is today in nearly all the industrial cities of the United States, it is not easy to find a neighborhood offering special advantages in this respect. Nevertheless, there are still cities where rents are reasonable and which will offer to the newcomer certain facilities encouraging his settlement. A look in the advertising pages of the trade press may assist in finding such localities.

The Power Supply

The power supply, so important in most machine shops, is now taken care of as a rule by large central stations that are found in all industrial neighborhoods. Where these cannot be had or where it is necessary to employ the factory's own produced power, the problem of coal supply deserves the closest attention. Our more recent winters have shown that the supply of coal is by no means so permanent as we might wish it. It may break down any moment again and the factory which is placed conveniently in this respect has a decided advantage.

The war has taught us many lessons. It has shown us that the basis of our industrial life is by no means as solid as we may have assumed it to be. For centuries we have been wont to talk about the inexhaustability of our national resources. We have learned now that we have come to the end of some of them and that others are not always as easy in our reach as they were to our fathers. Having once recognized these undeniable facts, we must set out to live more frugally and to make a better use of what is left to us. Locating our factories and industries in such a way as to facilitate economy of material and labor must be part of a policy of national efficiency and it is up to every machine-shop owner to take his individual share of the responsibility.

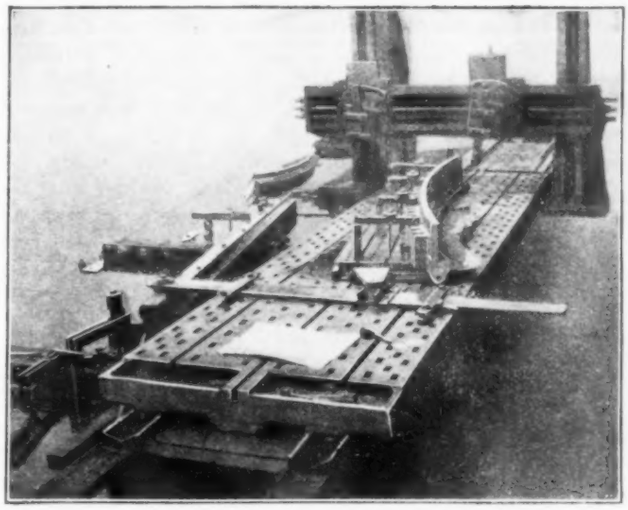
A Radius-Planing Device

By W. H. Shipler

A simple and satisfactory rig for planing large radii is shown herewith. When the illustration was made the device was set up for planing the interior curve of gear segments, the radius being 18 ft. 6 in., and the length of cut, 10 feet.

A specially built plate, having stake-holes and T-slots in its upper surface, is placed on the platen of a 72-in. planing machine, being attached thereto only by a stud at the forward end, about which it is free to swing.

Beyond the other end of this plate, a rectangular bar of iron is so mounted on the large platen that while it moves forward and back with the latter, it may slide lengthwise in a direction at right angles to the movement of the platen.



PLANING A LARGE RADIUS

A bracket on the rear end of the swinging plate carries a stud and slide block which work in a transverse yoke on the bar, formed by two pieces of angle iron bolted to the latter.

Mounted on the box parallels, alongside of the planing machine and held by bolts to the floor-plates, is a guide-bar and slide similar to the taper attachment of a lathe. The slide is attached to the end of the crossbar previously mentioned, and through it transmits movement to the plate upon which the piece to be planed is mounted. The amplitude of this movement is, within its limits, adjustable to plane any desired radius.

While the writer makes no claim to originality in devising this rig, he believes it to be a simple, satisfactory and inexpensive means of machining surfaces that would otherwise require a very large boring mill.

Why Don't the Employees Read the Shop Paper?

By Frank H. Williams

If there is anything more discouraging than to edit a shop paper and find that the employees don't read it, I would like to know what it is.

Certainly, it is a heart-breaking job to spend time, money, thought and work in getting up what you think is a "nifty" publication and then find that the employees, who should be reading each copy from cover to cover and preserving every issue for future reference, are actually using them only as a means of starting the kitchen fire in the morning, or for the purpose of adding to the poundage of waste paper sold to the rag man.

In some plants the regular monthly or weekly publication date of the shop paper is a real event. The employees talk about it and wait eagerly for their copies. They actually read them in the way that every shop-paper editor wants his publication read, and what they read makes a deep impression on them.

What's the answer? Why are some shop papers eagerly read and why do others receive little attention from the people for whom they are issued?

Well, perhaps your paper is too high brow. Highbrow talk to the average man and woman means dullness. Consequently, it too frequently happens that

when the editor does what the manager of the firm wants him to do—get out a publication that will be a credit to the institution—the whole thing "misses fire." It doesn't register at all with the employees who are the very persons for whom it has been issued, sometimes at considerable expense. The reason the employees don't like it is because it is just that—a credit to the firm in make-up, typography, paper, printing and diction, but a publication that is entirely lacking in the colloquial snap and pep which characterize the daily life of the firm's workers.

Getting the Shop Paper Read

To get itself read, a shop paper must tune itself to its readers. It must keep away from anything that savors in the least bit like condescension, or "high falutingness"—like an effort to teach by underhand methods, or like an attempt by the firm to show its superiority to its workers. A too-good paper has the appearance of doing all these things. Its very classy make-up and expensive paper make it look more like a memorial adopted by the board of directors on the death of the company's president, than like a handy, interesting, heart-to-heart talk from the executive end of the business to the laboring end. Its stilted English and perfect horror of splitting an infinitive makes it savor entirely too much of being too high-toned for common folks and the whole thing conveys the impression of being a matter of condescension on the part of the company toward its workers.

Perhaps the most fatal factor in creating this false impression in the minds of the workers and making them steer away from contact with the shop paper, is a too exacting use of the English language. It is all very well to have your diction absolutely perfect, but why do so when it simply makes the workers think you are poking fun at the way they talk or trying to air your superior knowledge?

Publications, to get by nowadays, have got to talk in the language of the people to whom they are addressed. To get read they have got to sound like regular folks instead of like some long-haired man who is fussy on the subject of grammar.

The most popular magazines of the day are the ones that are colloquial in their articles and their stories, and that do not hesitate to throw in a bunch of popular slang phrases when the occasion seems to call for them. The least widely circulated magazines are the ones that strive always for "purity of expression" in everything they say.

The shop papers that fall by the wayside—like a flivver with a couple of flat tires and a "busted" carburetor—are quite generally the ones that are conducted on the principle of saying a thing properly instead of saying it the way that Jim in the blacksmith shop or Joe in the machine shop would be apt to say it.

Look at the proposition from the standpoint of an outsider. You pick up the splendidly printed and rich-looking shop paper of a large manufacturing company. The thing looks "deadly," to put it mildly. It is as elaborately printed as the family history of some new millionaire—and it is just about as interesting to the layman. Look, for instance, at the account of a dance recently given by the boys in the office. Here's the way it reads:

"Thoroughly enjoyable was the dance given at the Tanner Academy last Thursday evening by the young men of the office force. The hall was tastefully decorated for the occasion in the National colors. Music was rendered by the Jazzbo Band. At a late hour refreshments were served."

Is it any wonder the employees won't read the shop paper when it is filled with dull stuff like that? It would be the most surprising thing in the world if they did read it.

Besides, is that the proper and uninteresting manner in which those responsible for the dance speak of it? Not on your life it isn't. Here's the way those young fellows talk about it:

"Some dance the office gang 'threw' the other night! Tanner's Hall—you know, best floor in the city. Jazzbo Band wiggled 'mean' fiddles. Eats at midnight; m'm 'n everything!"

Why not give that sort of an account of the dance? Make the little item sparkle and smile. Make the employees read it just because they will be entertained while reading it. Make the whole paper sizzle with the zest of living and the joy of being happy and healthy.

There's no real reason why employees shouldn't read every issue, if only the publications are written in a way to make the reading of them a delight.

To revert to the popular magazines—do you think any of them would have their present large circulations if they were always pompous and dignified and conservative? Do you think the popular magazines would ever get very far if their writers never "jazzed" 'em up a bit in their writings the way human beings do in their daily intercourse with each other?

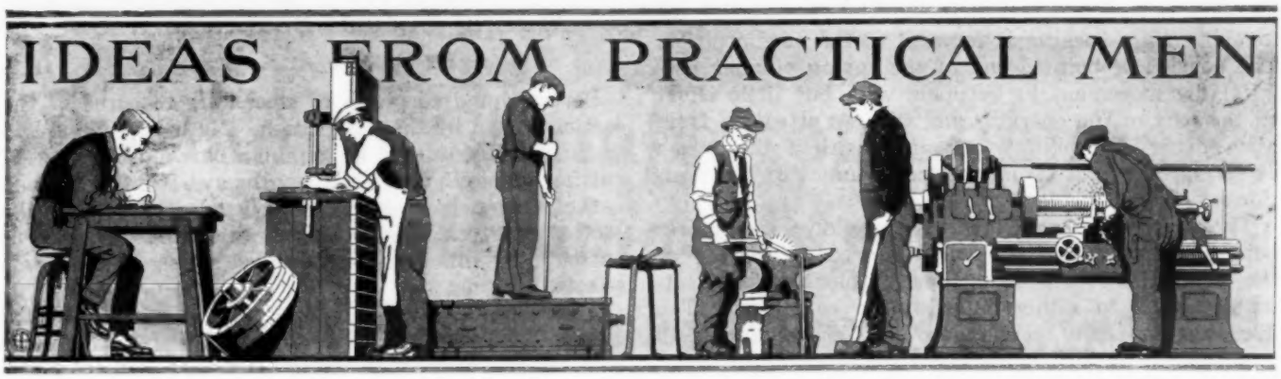
How to Get Your Shop Paper Read

The way to get your shop paper read is to put yourself in the position of the editor of a popular magazine. You are going to get out a publication and the only way you can get people to buy it is by putting into it the stuff they want to read. Do you imagine that if you were selling the paper to your employees you'd be so dull in the stuff you put into it? Rather you'd put into it the sort of stuff that employees would be willing to pay for; and, when you get into the frame of mind where you forget that your publication doesn't have to depend upon subscriptions and news-stand sales and where you feel that you must put into the house organ the sort of stuff that would make the employees "plank down" their good money for it, right then you will find that the employees are changing entirely from their former dislike for your paper and are not only reading it, but eagerly grabbing for it and saving every issue after they've read it.

Capstone Nickel Salts

Please give formula for a nickel solution for plating steel forgings; a good white deposit on rough work. Also a barrel plating solution for bright plating same class of work.

Answer—We do not make a practice of exploiting any special brand of plating salts in the Questions and Answers department, but the Capstone Nickel Salts distributed by the Hansen & VanWinkle Co., Newark, N. J., if used according to instructions which are sent out with the salts will give you just the deposit that you are looking for, both in the still solution and the automatic plating barrel.—*Brass World.*



A Quick-Action Drilling Jig

By Amos Ferber

The fiber rings, one of which is shown below the jig in the illustration and another in drilling position in the jig, require four holes drilled radially through them. By reason of the nature of the material, the actual drilling time was so short that it took several times as long to jig them as was required to drill the holes. The jig here shown was designed to reduce this proportion, and so simple and effective is it that the rings are now handled as quickly as though no jig was used.

A post is fastened to one face of a small angle plate and turned to the proper diameter to be clamped into the knee bracket of a sensitive drilling machine in place of the regular table. A hollow stud projects horizontally from one of the inner faces of the angle plate in such position that its center line intersects at a right angle the center line of the machine spindle.

Upon this stud there turns a shouldered ring of steel, the periphery of the larger shoulder of which is knurled to afford a grip for the thumb and fingers of the operator's left hand; while the smaller diameter fits the opening in the work, having keys fitting into the grooves of the latter for the purpose of locating it.

Let into the upper edge of the angle plate and held by screws there is a piece of steel with a properly located round hole for the drill bushing and beyond the latter a rectangular hole in which slides the steel piece which may be seen to the left of the drill; which, bending out around the drill chuck and quill bracket of the machine, is attached by screws and dowels to the upper part of the quill and moves up or down in unison with the drill.

The shouldered steel ring before mentioned bears closely against the inner face of the angle plate, being held thereto by a shoulder on the hollow stud which latter is put through from this side and held by a nut. The ring thus is confined against end movement, but is free to turn.

A spring plunger, having its inner end pointed to about the angle of a twist drill, is located in the base of the angle plate immediately under the shouldered ring, its beveled or pointed end entering correspondingly shaped depressions upon the knurled edge of the latter. It may plainly be seen in the cut. There are four of these depressions, locating the steel ring successively in the desired drilling positions.

To put a fiber ring in the jig all that is necessary is to pick it up in the left hand and place it on the shoulder to which it is fitted, entering the keys in their respective slots as the ring goes to place; this requires but a fraction of a second, and while this is being done the right hand is bringing down the drill.

As the drill comes down the steel guide piece moving with and slightly in advance of it strikes against the fiber ring, and by reason of its beveled end, pushes the ring up against the shoulder of the indexing ring,

AN INDEXING DRILLING JIG

insuring that the hole shall be drilled in the center, widthwise, of the fiber. As the drill is fed downward the guide piece continues on past the end of the indexing ring; entering a clearance hole in the hollow central stud.

When the drill is raised, the thumb and fingers of the operator's left hand (which during the drilling has

not left the work) grasp the knurled portion of the indexing ring, turning it forward to the next position. The beveled or pointed end of the spring plunger permits this movement to be made with but little effort on the part of the operator and without attention from him or her, the plunger receding against the action of its springs; yet it unmistakably indicates the position of the next hole.

These movements follow very rapidly; the pieces being accurately indexed and centered as quickly as they could be drilled in an open V-block with no attention paid to either indexing or centering. The fiber ring is free to be taken out any time that the drill is raised. Any position is right for stopping or starting; all that is necessary is to put in a piece of work and make the required number of movements.

Because of chips or burs of the fiber being carried by the drill into the clearance holes in the indexing ring there would be difficulty in taking off the drilled rings if the operator's fingers were relied upon, and therefore, a mechanical ejector forms a part of the jig. Four steel pins about $\frac{1}{4}$ in. in diameter pass through holes in the angle plate, being arranged concentrically with respect to the center of the hollow stud which is the center of the whole device. Four holes axially through the larger diameter of the indexing ring permit these ejector pins to pass through the latter and bear against the fiber when the indexing ring is in any one of the drilling positions. A round steel plate has a central stud, and through holes near the edge of this plate the shouldered outer ends of the ejector pins are riveted.

No part of the ejector can be seen in the picture for the reason that all exposed parts are outside the angle plate away from the observer, while the inner ends of the ejector pins are covered by the fiber ring in the jig.

A spring maintains the position of the ejecting device with the ends of the ejector pins just clearing the indexing ring so as not to interfere with the movements of the latter; thus, a smart blow with the palm of the right hand against the round plate will cause the ejector pins to knock a fiber ring out of the jig and the spring will withdraw them instantly from the indexing ring. Should the blow be struck when the ring is misplaced—that is, between drilling positions—no harm would be done, as the ejector pins would merely stop against the steel ring and a blow from the hand could accomplish no damage.

This device was designed by Charles H. Cuno, and is in use in the shops of the Cuno Engineering Corp., Meriden, Connecticut.

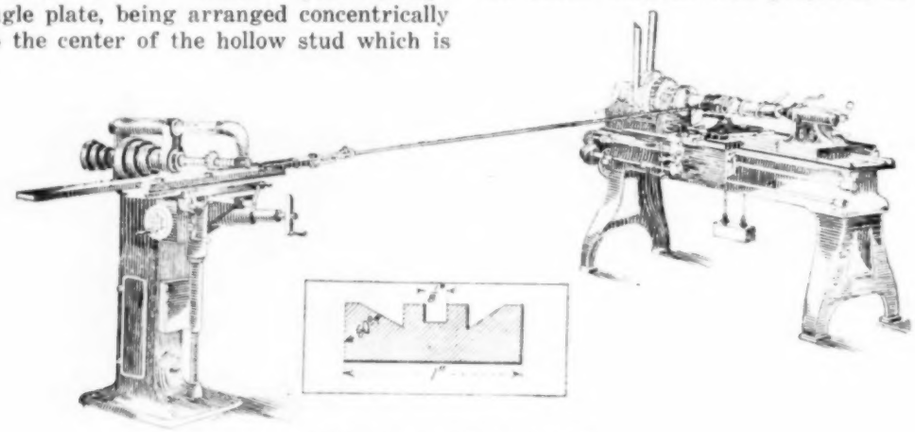
Milling Special Shapes in a Bar

By Donald A. Hampson

Several hundred pieces of steel were required of the section shown by the illustration. Naturally, these had to be machined from rectangular bars but instead of cutting to length first—the lengths averaging 3 in. each—the scheme here described was adopted to mill the section in stock lengths, after which the pieces were cut off. By this method a decided saving of time was effected.

Three cuts were made on each bar—one for the center channel and one each for the right and left angular face. Pieces clamped to the table of the milling machine guided the bars sideways and held them down to a running fit as they were drawn through. After the cutter was set in proper relation to these guides, the entire lot of bars was passed through before making a change to another cutting.

In starting, the end of a bar was beveled much as in screw machine work to make it easier to push against the cutter until an inch projected at the rear. Then



MILLING IN BAR LENGTHS

a clamp was fastened to this end for connection with the "power feed."

The lathe standing in the background furnished the feed. A 3-in. piece of steel on the centers, and driven by the dog, forms a drum on which is wound a rope that is carried to the clamp attached to the bar being milled. When the lathe is started, the bar is pulled through under the cutter at uniform speed, producing a smooth cut that could not be improved upon.

The quality of the work is better than that produced by the common method of cutting to short lengths first, while the saving in time is effected by the less frequent loadings and the higher rate of feed possible with this method. By selecting a day when the lathe was not in use, the tying up of an additional machine was a matter of no importance.

Very often in manufacturing and in special work a number of pieces are required that are best made of drawn steel but the shape is such that certain cuts in the direction of the bar must be made; if these cuts could be made over the whole length of the bar, the work would be greatly expedited, but equipment that makes such cuts possible is usually of the roll feed variety, the cost of which is out of all proportion and the further serviceability of which is problematical. The arrangement that is here described was set up in half an hour from parts already available and it answered just as well as an expensive outfit.

Pittsburgh Chamber of Commerce *Unanimously* Approves Directors Report!

The report of the Board of Directors of the Pittsburgh Chamber of Commerce, opposing the compulsory use of the metric system, which was given in full on page 309, was submitted to a vote of the members at the last regular monthly meeting and UNANIMOUSLY approved.

The importance of the metal-working industries in the Pittsburgh district is here graphically shown:

Value of manufactured product in Allegheny County for the year 1918 = $2,305,065,800.

Total value of wheat crop in the United States, 1918 = $1,874,623,000.

Value of gold production in the world in 1918 = $380,924,700.

The value of this action is obvious.

Now, Mr. Manufacturer, what is YOUR Chamber of Commerce going to do?

E. Thau Viall

Editor

The Veracity of Pro-Metric Statements

Read these Letters and others which will appear in our columns and draw your own conclusions as to the reliability of any statement made in literature issued by the World Trade Club of San Francisco in its pro-metric propaganda.

Rochester, N. Y., February 16, 1920.

Ethan Viall, Editor,
American Machinist.

Dear Sir:

Referring to yours of February 13th we have already received a communication from Mr. Burlingame advising us of the unauthorized use of this company's name by the World Trade Club of San Francisco. We have written the following letter to the club asking them to remove our name from the list as we are unalterably opposed to the use of the metric system in this country.

"World Trade Club,
681 Market Street,
San Francisco, Calif.

Gentlemen:

We have just noted that in the periodical issued by your organization, entitled 'Who Urges Meter-Liter-Gram?' the name of this company is listed as a manufacturer urging metric standardization. The use of our name in this connection is unauthorized and we request you to remove it from any further editions of this booklet, as we are unalterably opposed to the compulsory adoption of the metric system of weights and measures in this country.

Kindly favor us with acknowledgment of this letter."

Yours very truly,
Eastman Kodak Company,
F. W. LOVEJOY,
Vice President.

Athol, Mass., February 16, 1920.

Ethan Viall, Editor,
American Machinist.

Dear Sir:

Answering your letter of the 13th, our attention was called to the matter you refer to, several weeks ago, and we at once wrote to The World Trade Club of San Francisco asking for a copy of the printed matter said to have been issued by that club, in which our name appears as favoring the compulsory use of the metric system.

We have not yet received the literature asked for. Any such use of our name is entirely unauthorized and without our knowledge or consent. We are not in favor of the compulsory metric system.

Yours respectfully,
The L. S. Starrett Co.,
F. E. WING,
Treasurer.

Lockport, N. Y., February 16th, 1920.

American Machinist,
New York City.

Attention Ethan Viall, Editor.

Dear Sir:

In reference to the advice recently received from Mr. Burlingame that our name has been used by the World Trade Club as urging the standardizing of the metric system, beg to advise you that this statement was absolutely unauthorized. We are not in favor of the compulsory metric system, and have advised Mr. Burlingame that our name was used in this connection without authority.

Yours very truly,
Harrison Radiator Corporation,
H. C. HARRISON,
President.

New York, February 17, 1920.

Ethan Viall, Editor,
American Machinist.

Dear Mr. Viall:

Replying to your letter of February 13, I cannot understand how the World Trade Club of San Francisco happens to be using our name to urge the use of the metric system, as we have never knowingly endorsed metric standardization. We have taken the matter up with this concern and asked them on what authority they are using our name, and in the meantime I wish to say to you that such use is entirely without our knowledge or authority and we are greatly opposed to such a move, assisting the American Institute of Weights and Measures in their fight against its adoption.

Yours very truly
American Locomotive Company,
C. K. LASSITER,
Vice President.

Beacon Falls, Conn., Feb. 19, 1920.

Ethan Viall, Editor,
American Machinist,
New York, N. Y.

Dear Sir:

We are in receipt of your letter of Jan. 13th and have carefully noted contents. We understand that our name is being used by the World Trade Club as urging the use of the metric system. This is being done without our knowledge or authority.

You are at liberty to use this letter, as we would like to have it come before the public, showing how the World Trade Club has acted in this matter. We are writing them today relative to same.

Yours very truly,
The Beacon Falls Rubber Shoe Co.,
R. L. FISHER,
General Manager.

January 29, 1920.

The World Trade Club,
San Francisco, Cal.

Gentlemen:

We have just been advised that this company's name has been published in a pamphlet under your name, as one urging metric standardization.

We are at a loss to know who authorized any such use

of this company's name and demand that you either show authority or make a prompt and public apology.

Yours very truly,
Pratt & Whitney Company,
B. H. BLOOD,
General Manager.

WORLD TRADE CLUB
681 Market Street
San Francisco, Cal.

10 February, 1920.

Mr. B. H. Blood,
Gen. Mgr., Pratt & Whitney Co.,
Hartford, Conn.

Dear Sir:

Replying to your letter of January 29, 1920, let me say that Book 4, "Who Urges Meter-Liter-Gram?" was made up from letters received in this office, and from records received from Washington, D. C., of petitions directed to the Bureau of Standards, Department of Commerce. Every attempt was made, in preparing the manuscript of this book to indicate whenever a member of a concern spoke not on behalf of his firm but as an individual.

We will search through the thousands of letters that have been received here in order to answer your question as to the use of your company's name. Our impression has always been that the Pratt & Whitney Co. was a believer in metric standardization, because of the fact that in the report of Director S. W. Stratton, of the Bureau of Standards, for the International High Commission in 1915, your firm is named along with the *American Locomotive Co.*, the Baldwin Locomotive Works, the Standard Tool Co., *and many others, as a concern using metric gages and standards.* It may be that the name of your concern was included in Booklet 4, "Who Urges Meter-Liter-Gram?" because of this mention in Director Stratton's report.

In issuing further editions of "Who Urges Meter-Liter-Gram?" we shall of course eliminate the name of your company, if you request it. Please read the inclosed booklets.

Is it true that your concern manufactures gages and standards of metric measure and finds that this can be done with practically no inconvenience or increased cost?

Yours for world standardization,
World Trade Club,
(Signed) Aubrey Drury,
Secretary-Treasurer.

February 18, 1920.

World Trade Club,
681 Market St.,
San Francisco, Cal.

Gentlemen:

Answering yours of February 10th, you are hereby urgently requested to eliminate the name of this company from any and all mention among those who favor forcing the metric system down the throats of American manufacturers.

We have always been open-minded toward the more extensive use of the metric system, but your unfair and underhanded methods are calculated to drive us to the opposition. We believe in fair play. Your method of circulating petitions to the authorities results, as you well know, in certain people filling them out and mailing them as requested, while those opposed simply consign them to the waste basket. A practically unanimous vote by a small minority is thereby made to appear as representative, while the large majority have no vote. Why in the name of fairness, if you wished to be fair, did you not send out a ballot *for* and *against*, so that those wishing to vote might have a chance to express a preference? It is our belief that you did not dare to do so. This belief is based not only on the methods you are pursuing, but upon numerous and glaring misstatements of fact which we cannot believe are due entirely to ignorance.

The accomplishment of your aims would in our opinion be a commercial calamity. By this we refer to the compulsory adoption of the metric system by American manufacturers.

We do manufacture gages and standards of metric measure, but we do it by translating metric measurements into English before the drawings go into the shop, just as the Ordnance Department found it necessary to do with their French drawings during the war, or as we would do with Russian or any other foreign measurements with which our workmen are not thoroughly familiar. The added cost is passed on to the customer.

If the proposed law making the use of the metric system compulsory should become effective, it would bring us a large amount of business in providing new gages and standards. We, therefore, are not selfish in opposing it. But we do not want business which is a needless burden on the industry of the country.

We have had numerous inquiries from the technical press and from other manufacturers as to whether your use of our name in "Who Urges Meter-Liter-System?" was authorized. To all such we have roundly denounced your action. It is obvious that such inquiries and such answers tend to discredit your propaganda work, but unfortunately our denunciation can reach but a very small proportion of your mailing list, and we therefore demand a printed apology and renunciation on your part, reaching the full list of those to whom you have circulated misinformation.

Yours very truly,
Pratt & Whitney Company,
B. H. BLOOD,
General Manager

Latest Report from Washington

In view of statements to the effect that the present is not the best time to consider metric system legislation, Representative Vestal, the chairman of the House Committee on Coinage, Weights, and Measures, has agreed to withhold the bill pending the submission of a brief by the American Institute of Weights and Measures. The brief, which will set forth the disadvantages of starting a metric system agitation at this time, will be laid before the committee, which will decide whether or not the matter is to be taken up at this time.

Since announcing that the metric system bill will be introduced, Representative Vestal has been flooded with communications bearing on the subject. Some have requested that he allow the bill to be introduced by some other member as it was feared that there would be implied necessity for him to work for the passage of the bill which will bear his name. Mr. Vestal calls attention to the fact that it is a very common occurrence in both the House and the Senate for members to introduce bills for the simple purpose of getting them up for consideration and which they in no other sense sponsor. He admitted, however, that he is considering having the bill introduced by another.

The bill providing for the compulsory use of the metric system in Government Departments was practically ready for introduction when Mr. Vestal became convinced that it hardly would be fair to raise the issue on the Government Departments alone, when it simply meant that it was to be an entering wedge with the idea of making it generally compulsory at the next step. He expressed the opinion that the bill should stand or fall on the general proposition of making its scope nationwide.

The redraft of the bill has not been completed but it is thought that it will be in final form before the end of the month.

Observation of a Field Editor

By FRED H. COLVIN

Machinery in Houston, Texas

The machine-tool situation in and around Houston, Texas, must not be considered in the same light as in either New Orleans or Mobile. The conditions and the outlook in these places have already been outlined, and they are not particularly encouraging, for the near future at least.

Houston, on the other hand, not only wants machines now, but is likely to want more in the future. This city may be called the center or headquarters of the South Texas oil fields, and these are increasing every day. Although new as an industrial city it has already laid a firm foundation for the future and comes as a surprise to the traveler when he sees twenty-story buildings rise out of the prairie as he approaches it.

* * *

Here is the active headquarters of the Texas Oil Company and many others, with oil fields within a short radius and others farther afield. Here, too, are huge new oil refineries which combine all the best experience of the past and which are the last word in both buildings and equipment; and still more surprising, Houston is now a seaport of no mean proportions in spite of its being 52 miles inland from the Gulf of Mexico.

Taking advantage of inland water and spending money freely in dredging shallow waterways, as well as cutting a real ship channel for several miles and a turning basin for ocean-going cargo ships, Houston is today shipping millions of dollars worth of cotton direct to European ports.

This waterway affects its position in the machine-tool market by making it possible to receive machinery direct from New York, Philadelphia or Baltimore in seven to eight days, by boat, and with no rehandling.

* * *

Further than this, Houston is no longer in the jobbing-shop class, but is fast becoming a manufacturing center for oil-well tools as well as a distributing center for oil-well and similar supplies. The demand for oil-well tools of the latest and best type—the ability and the willingness to pay a good price for good tools—has developed manufacturing to an unbelievable extent. Instead of the job shop of the usual Southern city we find new shops with saw-tooth roofs, with batteries of motor-driven standard machine tools, well equipped, and other things equally surprising. These, however, will be shown later.

So far as concerns machine tools, the great demand is for deliveries—price is not so important—and the recent advance in lathes did not prevent new orders being placed. This section of the Southwest will be well worth watching and cultivating.

The question as to how long this will continue, is by no means certain. There is every reason to believe, however, that it will last a long time, as the demand for oil for fuel is increasing by leaps and bounds. A very few years ago it was necessary for the producers to build huge storage tanks, some of earth and some of metal, where millions of gallons of oil were stored to prevent it from going to waste. Today the demand outruns the supply and is still going. New wells are coming in every day and will continue to do so.

The small companies which are springing up everywhere in this section are for the most part likely to strike oil, but it must be remembered that this is only the beginning and that the oil game is one which runs into money by millions, not figuratively but literally.

* * *

Not only is oil-well drilling expensive—the average hole costs approximately $50,000—but that is only the beginning, even assuming that it comes in all right and that it does not blow out all the three or more thousand feet of casing and demolish the derrick and machinery. The oil is of little value until it is refined and it must be sold to the large companies who own and operate refineries. This also involves transportation, and here is where the millions play their important part.

The only economical way to transport oil is in pipe lines, and these cost money, not only for the pipe, which now runs around two dollars a foot, f.o.b.—but in laying it, which costs real money. It also involves pumping stations every twenty or thirty miles, sometimes maintaining a little settlement twenty miles from a railroad, all of which requires capital in huge chunks.

* * *

These pipe lines run clear across the country to New York for export shipping. They almost honeycomb the State of Texas, where thousands of miles are already laid and in use. This of itself makes it a rich man's game, and the usual result is that, after a small company gets a good-paying well, the large company makes an offer for it and usually gets it. If the demand is good, as at present, the small company makes a profit, but if the demand is poor, the terms are correspondingly lower.

The huge companies play a safe game. They are glad to let the little fellow develop the properties. He takes the risk, for the lure of oil-well prospecting and drilling is closely akin to that of mining, though the distribution is different.

Whatever happens, however, Houston is likely to be a good market for machine tools and supplies for some time to come. One house is now handling over a million dollars' worth of general supplies a month.

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

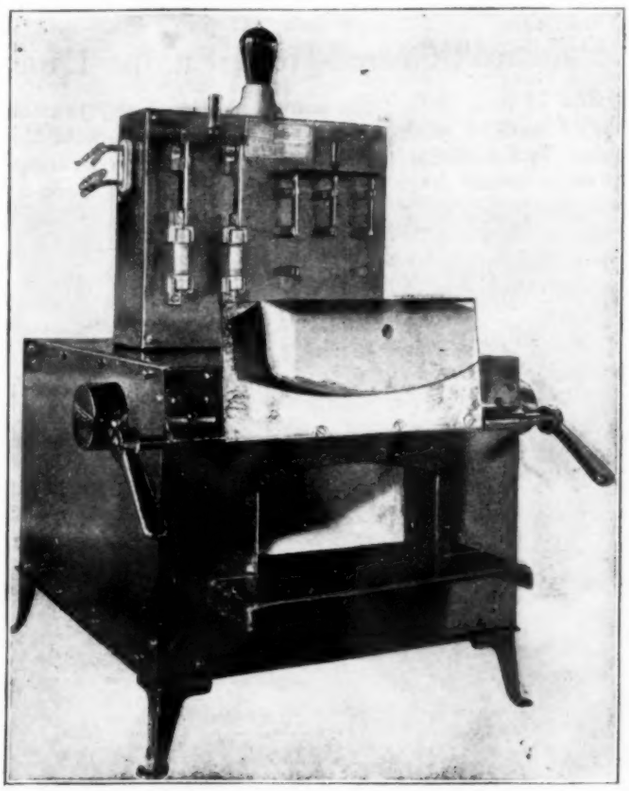
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

General Electric Muffle Furnace

The General Electric Company has developed an electric furnace of the muffle type, which is designed to meet the demand for a durable, economical and convenient furnace for temperatures up to 850 deg. C. (1,562 F.) for baking vitreous enamel, hardening and tempering tools, dies, etc.

The device as shown in the illustration consists of the furnace proper with a control panel mounted on top



GENERAL ELECTRIC MUFFLE FURNACE

of the front. The heating element is mounted on the outside of the muffle and covered with compound. It is claimed that it is so placed as to give a very even distribution of heat throughout the inside. The element is divided so that it is possible to get two degrees of heat. The muffle is mounted in a strong steel casing, and the walls, door, etc., are thoroughly insulated, thus preventing loss of heat from radiation.

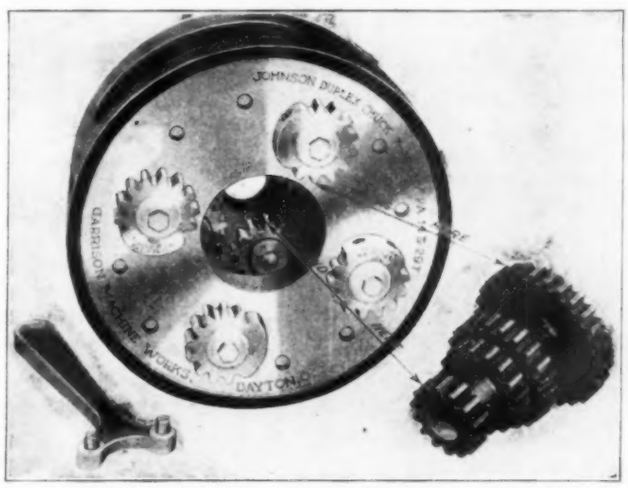
The control panel is equipped with a main-line switch, a double-throw switch for high or low heat, and a red pilot lamp which acts as a warning to the operator when the furnace is at high heat. There are connections at the side of the panel for connecting rheostats when temperatures as low as 300 deg. C. (572 F.) are desired.

The furnace is further provided with a shelf in front for the convenience of the operator, and the door is equipped with counterweights to keep it open. The high heat requires 4 kw. to bring it up to 850 deg. C.

Johnson Duplex Universal Gear Chuck

A special chuck designed to hold a gear cluster while the hole is being bored or ground, is a product of the Garrison Machine Works, Dayton, Ohio. The term duplex applies to the manner in which the chuck grips the two outer gears of the cluster. The illustration shows how this is accomplished.

In place of the ordinary chuck jaws, small eccentric gears are used. Four of these are mounted on the outside face of the chuck and are free to turn. The face of the chuck is also free to turn in the casing or body,



JOHNSON DUPLEX UNIVERSAL GEAR CHUCK

a spanner wrench being used for this purpose. Three other eccentric gears are mounted inside the chuck on the back face. All of the eccentric gears have but a slight throw when turned. When chucking a cluster and the spanner wrench is applied with a closing movement, all of the gears turn a part of a revolution, as they are geared together by the cluster. As a result, the two outer gears of the cluster are firmly gripped and held by the wedging action of the two sets of eccentric gears. The cluster is thus automatically

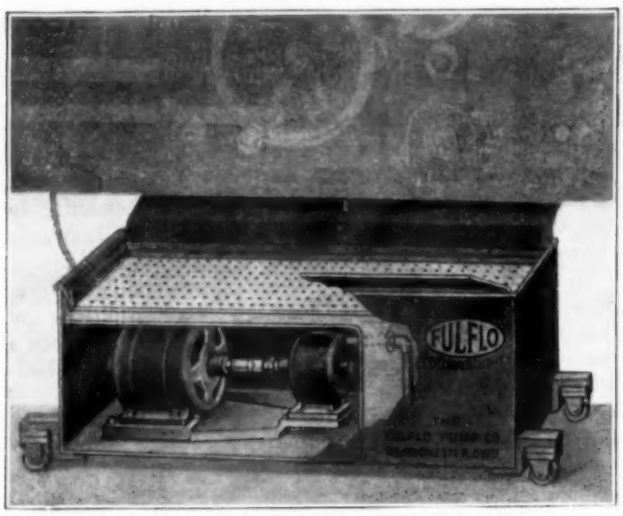
centered with a balanced pressure by the universal movement of the chuck.

The chuck has a range of 0.010 in. plus to 0.020 in. minus on the pitch diameter and it is claimed that after the hole is ground the pitch line will not vary 0.003 in. from truth. The four openings in the rim of the chuck, besides admitting the spanner wrench, serve to prevent the accumulation of chips, etc., within the chuck. The body of the chuck is made from cast iron that is first rough-turned and then allowed to season before being finished. The chuck members and their supports are of alloy steel and are hardened and ground. The diameter of the chuck is approximately 5 in. larger than the gear it is used for, and the weight averages about sixty pounds.

Fulflo Portable Motor-Driven Pump

The illustration shows one of many applications of a portable motor-driven pump unit made by the Fulflo Pump Co., Blanchester, Ohio.

This unit was designed to supply lubricant to the cutting tools on machines not originally equipped with a



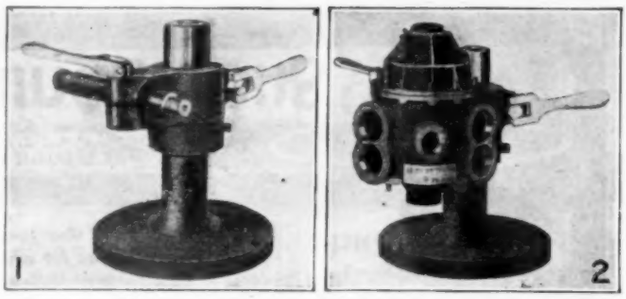
FULFLO PORTABLE MOTOR-DRIVEN PUMP

pump. It can also be used on machines having individual coolant systems when for any reason the system may be out of commission.

In operation it is only necessary to roll the unit beneath the machine to be supplied with coolant and to attach the motor cord to a lamp socket. Provision is made for attaching additional splash boards when required. The pump and motor are completely covered and it is claimed that the pump is not affected by dust, grit or chips.

Thor Vise for Pneumatic Drills

The Independent Pneumatic Tool Co., Chicago, Ill., has introduced a special vise for use in connection with pneumatic drills of all makes. The vise, shown in Figs. 1 and 2, holds the drill body in various convenient positions for assembling, repairing and testing. It is made of a flanged upright column upon which is mounted a stop collar and clamp bracket. The stop collar supports the clamp bracket at the correct height for the workman, being locked by a setscrew. The clamp bracket can swivel on the column until securely locked in position by means of the clamp handle. At the



THOR VISE FOR PNEUMATIC DRILLS

outer end of the bracket, a second clamp, at right angles to the first, is used to hold a stem of correct size to fit the drill. The stem has a threaded end to fit the dead handle hole of the drill. Three stems are furnished having $\frac{1}{8}$-, $\frac{1}{4}$- and $\frac{3}{4}$-in. pipe threads respectively. When screwed into the drill body the shank may then be placed in the bracket hole and clamped in position. When the drill body is to be supported in a vertical position, as shown in Fig. 2, an additional fixture is used, known as a stem support. This simply provides a vertical hole for the stem to fit into. To obtain the best results the special vise should be located conveniently near the workman's regular vise.

"Standard" Geared-Head Engine Lathe

The 14-in. x 12-ft. lathe shown in Fig. 1 is known as the "Standard" and is a product of the Springfield Machine Tool Co., Springfield, Ohio. It differs in design to some extent from other geared-head lathes made by this company. A positive clutch is used instead of a friction clutch to return the carriage at high speed when cutting threads. This clutch is operated by the lower lever on the front of the headstock. The machine is equipped with the regular friction clutch by means of which the power can be instantly applied or released while the motor is running.

A Logansport air chuck and special tool rest, as shown in Fig. 2, are provided for cutting threads. The rest is adjustable and carries a circular threading tool combined with a small turning tool of high-speed steel. The turning tool is adjusted for the diameter of the

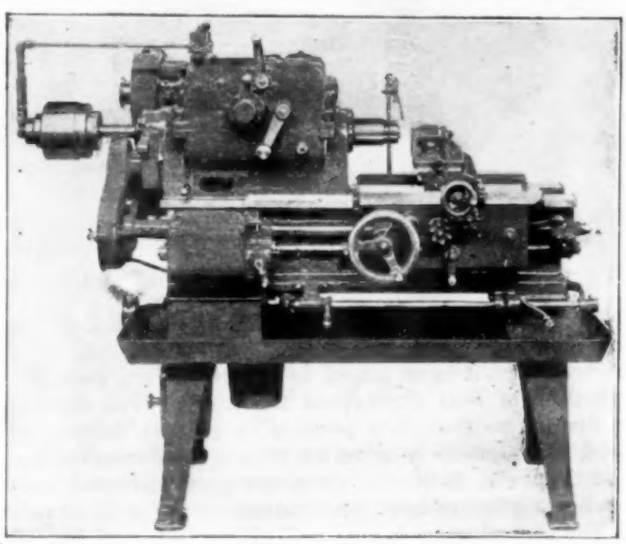


FIG. 1. "STANDARD" GEARED-HEAD ENGINE LATHE

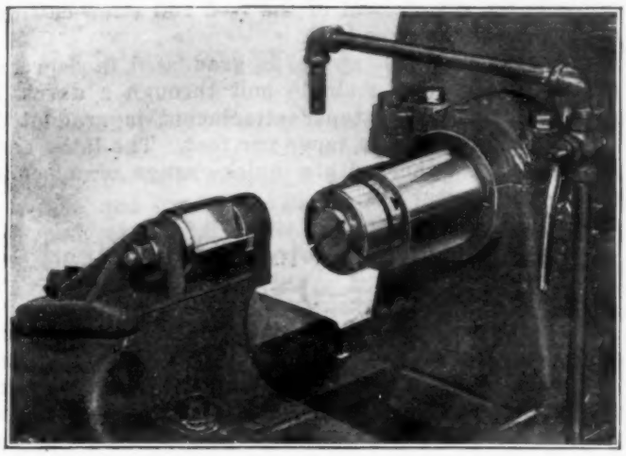


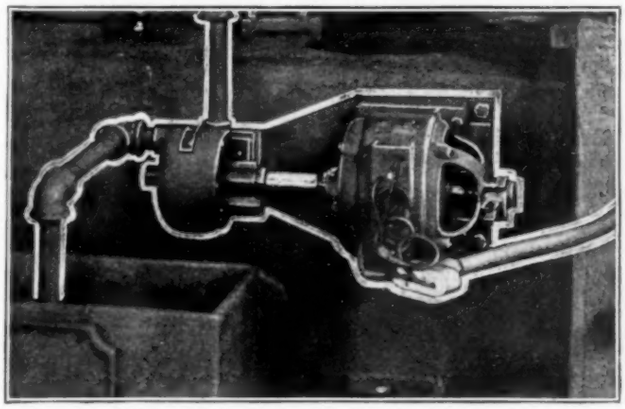
FIG. 2. AIR CHUCK AND SPECIAL TOOL REST

work and is independent of the threading tool. The function of the arrangement in Fig. 2 is to turn and thread collars from the rough by passing over them once. A 1½-hp. motor is mounted back of the headstock, and a silent chain is used for the drive.

The Fulflo Electrically Driven Pump

The Fulflo Pump Co., Blanchester, Ohio, has added to its line an electrically driven pump for permanent installation on machines provided with the company's drainage systems.

This makes it possible to attach the unit at almost any convenient place, even where a belt-driven pump



FULFLOW ELECTRICALLY DRIVEN PUMP

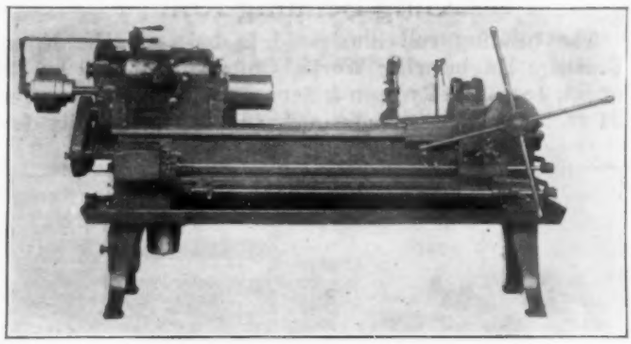
would be hard to operate on account of interference with the belt by overhanging or moving parts.

The pump can be mounted above the level of the coolant, as it is claimed that it will hold its priming without the aid of check or foot valves.

In operation it is only necessary to attach the motor cord to a lamp socket.

"Springfield" Boring Lathe

The lathe shown is intended only for boring and reaming operations at high speed. It is a recent development of the Springfield Machine Tool Co., Springfield, Ohio. It has a geared head and the same system of clutch controls used on standard models of this make. The lead screw is omitted, as it is unnecessary for the work mentioned. The air chuck is of the collapsible collet type. The carriage is the same style that is commonly used for boring spindles and axles. The steadyrest is of special design and consists of a counterbalanced quick-acting locking mechanism requiring merely a push of the hand to open it and a slight pull to close it. The cutting lubricant is circulated by a pump and is carried to the work by means of telescopic brass tubing. The motor is attached at the rear and has a silent chain drive.

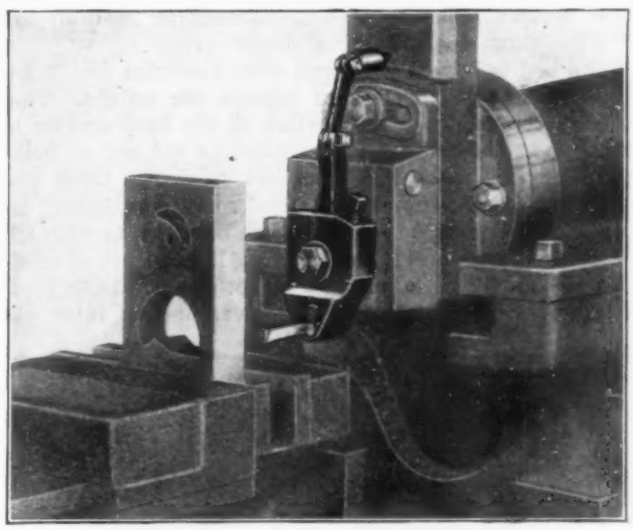


"SPRINGFIELD" BORING LATHE

Bruno Slotting Attachment for Planing and Shaping Machines

The H. A. Moore Co. Rochester, N. Y., has placed on the market the Bruno slotting attachment for planers and shapers as shown in the illustration herewith.

The device is simple in construction and can be readily attached to the clapper of a shaper by removing the toolpost and using a clamping bolt furnished for the purpose. An adjustable friction arm provided with a



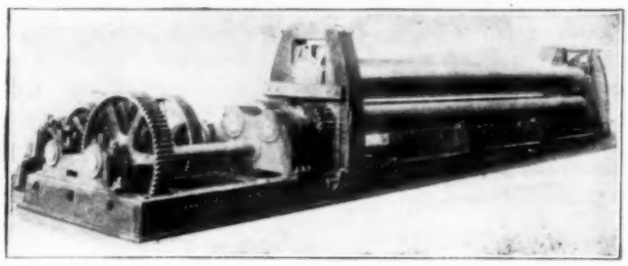
BRUNO SLOTTING ATTACHMENT

spring buffer insures the dropping into place of the clapper at the end of the return stroke and is claimed to prevent vibration of the tool at any speed. The cutting tools can be made of ordinary stock and may be turned to any position to cut on bottom, side or top.

Three sizes are made taking tools with round shanks of the following sizes: No. 0, ⅜ to ½ in.; No. 1, ½ to ⅝ in.; No. 2, ⅝ to ¾ in. Each size is furnished with two cutting tools. Weight, 5 pounds.

Kling Bending Roll

The bending roll illustrated is built by the Kling Brothers Engineering Works, Chicago, and sold by its agent, Joseph T. Ryerson & Son. This machine measures 34 ft. 2 in. between housings, and has a capacity for



KLING BENDING ROLL

bending ¾-in. mild-steel plates. Cut gears and bronze bushed bearings are used throughout.

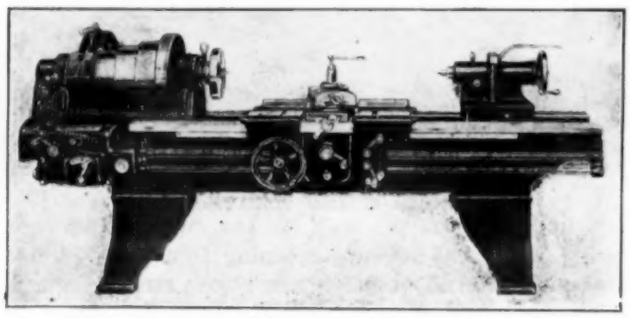
The top roll is 29 in. in diameter and weighs about 40 tons. The bottom rolls are 21 in. in diameter and each has two roller supports. The whole machine is built on a rigid gray cast-iron base. The drive is by two direct-current motors, one for the main roll drive and the other for power adjustment of the top roll.

Morris 22-In. Engine Lathe

The Morris Machine Tool Co., Court and Harriet Sts., Cincinnati, Ohio, has placed on the market the 22-in. engine lathe illustrated herewith.

The headstock is of the semi-inclosed type and is provided with large reservoirs from which oil is supplied to the bearings. The tailstock is offset and will permit the compound rest to be set parallel with the ways. The base is graduated and provided with set-over screws. The spindle is clamped in position by two bushings operated by a single screw.

The bed is braced with numerous crossribs and is so supported on the legs as to balance the weight. The carriage travels on a flat surface at the back and on a large V at the front. It is gibbed to the bet at both the front and back and is drilled so that a taper attachment can be supplied. A dial for screw cutting is provided. The apron is a one-piece box casting with all bearings cast as an integral part. All gears are of steel and the shafts have bearings at both ends. Both feed frictions are operated with one lever and an interlock



MORRIS 22-IN. ENGINE LATHE

Specifications: Distance between centers (8-ft. bed), 3 ft. 6 in.; swing, over shears 23 in., over carriage 15 in.; front spindle bearing, 3¼ x 6 in.; hole through spindle, 2 in.; taper hole in spindle, Morse No. 6; spindle speeds, eighteen, 10 to 300 r.p.m.; countershaft pulleys, 16 x 4½ in.; countershaft speeds, 165 and 200 r.p.m.; weight, crated 3,800 lb., boxed 4,750 lb.; size of case, 134 x 46 x 46 in.; cubic feet, 165.

prevents the engagement of the feed and screw-cutting mechanism at the same time.

The compound-rest swivel is graduated in degrees and is clamped by a single bolt through a dovetail clamping ring. The taper attachment is graduated both in degrees and in taper per foot. The lathe can be furnished either with a quick-change or a semi-quick-change gear box.

Reed-Prentice 14-in. Geared-Head Lathe—Erratum

In the article describing the Reed-Prentice 14-in. geared-head lathe on page 315, Vol. 52, the statement was made that the regular equipment included a taper attachment. The maker advises us that this is not correct, as the taper attachment is only furnished as an extra.

Less Scrap and More Production

BY JOHN J. WHARTON

Having just read on page 157 of *American Machinist*, John R. Godfrey's article on Johnson's "spoiled work" campaign I am much interested in it. I worked as an apprentice machinist in a shop for four years and found conditions that Johnson certainly could have wiped out by his new plan.

In this particular shop, piece-work rates were continually being lowered because a man finished up a job an hour or two before time, until the situation got so bad that over half the ordinary piece-work jobs were cut down so much that it was impossible for a man to make any extra time on them; still the management expected him to turn out the job in the usual time he had made when the piece-work rates allowed him an hour or two extra.

As Mr. Johnson says, a man with an ounce of gray matter in his head would balk at this attitude of the management. It went so far that when a man was assigned to a piece-work job, one of his fellow workers, who had previously worked on the job, would come to him and tell him "to take it easy" because there was no money in it; consequently, the man would take his time and the job he had to do would take twice as long as it would have done had he had a reasonable rate.

What the management gained by cutting rates on piece-work, I could never discover. They certainly wanted the job finished up quickly when they put a piece-work rate on it, or they would not have issued a card on it.

In regard to paying for not spoiling work, I think it is a splendid idea. It will not only make the men careful, but it will make them put all that is in them on the job. I have seen job after job scrapped, that the foreman never knew anything about, for the simple reason that if it became known, the man would likely lose his job. The foreman never seemed to think that even the best of us make mistakes. A large percentage of all the spoiled work was due to the machines themselves, rather than the man; some of the machines used should have been scrapped instead of the jobs.

The production game has several sides and in regards to treating the men with fairness, I think Johnson has the right idea. If more of the men in charge of shops would try to see the employees' side of the situation I think we would have better conditions and greater production.

Investigation of Phosphorus and Sulphur in Steel

A REPRESENTATIVE committee has been appointed at the initiative of the American Society for Testing Materials, the U. S. Railroad Administration and the U. S. Bureau of Standards, for the investigation of the effect of phosphorus and sulphur in steel.

The need for a research on this subject has been felt for some time, but it required the stringency of war conditions to bring the question sharply home to the manufacturers and users of steel. It will be recalled that the American Society for Testing Materials recognized at its annual meeting in 1918 the abnormal difficulty in obtaining an adequate supply of steel in time of war, and particularly of meeting the phosphorus and sulphur limits as specified in the A. S. T. M. specifications, owing to the high-sulphur coal and low-phosphorus pig iron and scrap which had to be used to meet war-time demands. The society accordingly raised the limits for sulphur in all steels and for phosphorus in acid steels 0.01 per cent above the requirements in forty-three of its specifications for steel, to be effective during the period of the war and until otherwise ordered by the society. The armistice was signed in November of 1918 and in the next six months conditions had so improved that the society restored the original limits for phosphorus and sulphur in twenty-nine of these specifications, covering what might be called the special steels, such as spring steels, forging steels, and tire and wheel steels. Action on the removal of the note from the remaining fourteen specifications, covering in general the tonnage materials such as plates for buildings and ships, was deferred until 1920. The Committee on Steel of the Society, however, realized that it was essential to secure reliable information concerning the effect of phosphorus and sulphur in steel in order to make suitable recommendations to the society concerning the limits of these elements in the A. S. T. M. specifications.

The Committee on Steel recommended to the Executive Committee of the Society that a thoroughly representative joint committee be formed consisting of representatives from those organizations and industries having a particular interest in the subject. A hearty desire to co-operate was evidenced by all interests approached, and the joint committee was formally organized on Nov. 29, 1919. The personnel is now as follows:

Representing the Bureau of Standards: George K. Burgess, Bureau of Standards, Washington, D. C.; H. L. Whittemore, Bureau of Standards, Washington, D. C.

Representing the U. S. Railroad Administration: F. M. Waring, Pennsylvania Railroad, Altoona, Pa.; H. E. Smith, Box 491, Eleventh Street Station, Washington, D. C.

Representing the American Society for Testing Materials: Robert W. Hunt & Co., 90 West St., New York; T. D. Lynch, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

Representing the Society of Automotive Engineers: F. P. Gilligan, Henry Souther Engineering Co., Hartford, Conn.

Representing the Association of American Steel Manufacturers: E. F. Kenney, Midvale Steel Co., Widener Building, Philadelphia, Pa.; J. J. Shuman, Jones & Laughlin Steel Co., Pittsburgh, Pa.

Representing the Steel Founders' Society of America: J. E. McCauley, Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa.

Representing the U. S. War Department: F. C. Langenberg, Watertown Arsenal, Watertown, Mass.

Representing the U. S. Navy Department: D. J. McAdam, Naval Engineering Experiment Station, Annapolis, Md.

Representing the U. S. Shipping Board: Frank Gentles, 140 North Broad St., Philadelphia, Pa.

Representing the National Research Council: John H. Hall, Taylor Wharton Iron and Steel Co., Highbridge, N. J.

The tests are to be divided into two series. Series A includes six groups of material, each typical of its class as to carbon and manganese, and with phosphorus and sulphur ranging from 0.02 to 0.08 per cent, it being understood that when studying the effect of sulphur, the phosphorus content is to be as nearly constant as possible and equal to the usual value for the group of material, and vice versa. Also, the sulphur in the steels of this series is to be "residual sulphur"; that is, sulphur present in the steel through fuel or from pig iron or scrap.

Series B is designed to provide for higher sulphur than can, generally speaking, be obtained as "residual sulphur." In this series, therefore, sulphur may be added during the later stages of manufacture. Any heats originally prepared for series A which run too high in phosphorus or sulphur may be diverted to series B.

Although the committee has been formally in existence only for some two months, it has made a good beginning. The following committees have been appointed: Committee on Statistics: H. L. Whittemore, chairman; Committee on Manufacture: Geo. K. Burgess, chairman; Committee on Tests: F. C. Langenberg, chairman.

The Committee on Statistics will visit steel manufacturers and users to obtain information on material high in phosphorus and sulphur which has either failed in service or which has proved satisfactory. A complete record of such material will be obtained, if possible. Material worthy of study will be secured and placed at the disposal of the Committee on Tests. The committee will also prepare a bibliography of this subject for the use of the joint committee.

The Committee on Manufacture will supervise the manufacture of all steels to be prepared under the program of tests adopted by the joint committee and revised from time to time. Members of the committee or their representatives will be present at all essential operations in the manufacture of steels to be tested.

The Committee on Tests will receive all material as submitted to it by the other two committees and make suitable tests upon it in accordance with the program of tests outlined by the joint committee. Special proof and service tests, including impact and endurance tests, will be made where possible. The committee will also endeavor to determine the amount and types of gases present in steels under investigation.

The Committee on Manufacture has supervised the manufacture of a number of tons of rivet steel, and will select all material which is approximately constant in chemical content as to carbon, manganese and phos-

phorus, with sulphur varying from 0.03 to 0.08 per cent. A beginning has been made in the tests of series B by arranging with a large steel company for the manufacture of three heats of steel—covering plate and structural steels, forging steels, and wheel, tire and rail steels—from each of which eight ingots will be poured to obtain varying sulphur content from 0.04 up to 0.15 per cent, by the addition of sulphur or iron pyrites in the pouring box.

The greatest interest has been shown in this investigation. The manufacturers in particular have given it their very hearty support, having agreed to furnish the material necessary to conduct the investigation. The Government Departments have offered the facilities of their laboratories for conducting tests, as have also the manufacturers and several of the large railroads who have been approached. The various interests represented on the joint committee have agreed to assume such expenses of the investigation as come up naturally in the course of their participation therein, so that up to the present the joint committee has not found it necessary to raise a general fund for this purpose; nor is there any reason to believe that, for the present at least, the raising of such a fund would be necessary. Financial matters have been delegated to a committee on finance.

It is hoped that this investigation will receive the hearty support of all persons and organizations at interest. Any information of value to the committee will be welcome and should be sent to the secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pennsylvania.

Non-inflammable Japan

Baking japan as ordinarily used in manufacturing consists of two elements, the base and the solvent. The base is usually some variety of asphalt, combined with linseed, or some similar oil, the whole making a hard, rubbery appearing substance. This must be liquified for use, and the common practice is to dissolve it in naphtha, or kerosene. The process of japaning various metal articles consists of dipping them in the liquid japan, and then baking them in an oven.

Owing to the volatile and inflammable type of the solvents used, this baking process is somewhat hazardous. After several bakings have been consummated the atmosphere in the oven resembles that of the inside of a gasoline engine cylinder, only needing a spark, or even excessively high temperature to cause an explosion of great force.

Manufacturers became interested in the possibility of developing a type of japan with a non-combustible solvent. The Research Laboratory of the General Electric Company was requested to try to evolve such a product and a course of research resulted in the development of a variety of japan which eliminated the necessity of a hazardous solvent.

A "Water" Japan Evolved

This water japan, as it is called, is an emulsion of the asphalt oil base with water. It was found that this japan had no tendency to settle out, even after months of storage, and that, owing to its being "suspended" in water, losses by evaporation were practically negligible.

The methods of applying the japan are two in number, the electric dip and the hot dip. The former is appropriate for small articles and consists in placing them, charged positively, in a negatively charged iron tank of japan. The result is that an even, smooth coating of japan is deposited on the articles in question, and, since the japan is deposited free from solvent, there is no resultant drip when the lot is conveyed to the baking ovens.

The second method, or the hot dip, which is applicable to large pieces of metal, was found more or less by chance. It had been the custom in the laboratory to preheat the metal before dipping, in order to free it from dirt and grease. This preheating evidently had the same effect of causing the japan to form a deposit on the metal as giving it a positive electrical charge. A third method is also sometimes used which is a combination of the two already mentioned. That is to say, the metal is both heated and positively charged.

The result has been that a variety of japan has been evolved that gives exactly the same effects as the solvent variety. It is cleaner to handle, owing to the absence of drip, and eliminates the danger of explosions and fires.

Deoxidizing Molten Iron by the Use of Ferro-Cerium

A recent addition to the list of substances for deoxidizing molten iron is the metal cerium. At it melts at 1,180 deg. F. its ferro-alloy lends itself readily to assimilation in molten cast iron.

Cerium for this purpose is used in an alloyed state containing 50 to 60 per cent lanthanum and 15 per cent didymium, samarium, etc. In this state it is known as misch metal.

For use in deoxidizing iron, misch metal is diluted with about 30 per cent of iron and in that state the melting point is from 1,480 to 1,650 deg. F., or well within the melting point of cast iron.

The best method for use is said to be sprinkling the granulated alloy in the stream of molten iron as it issues from the cupola or furnace spout. Used in this way the alloy becomes red hot by the time it reaches the ladle and readily assimilates with the iron.

The cerium group of metals is exceedingly active chemically and has a great affinity for oxygen. The result of its use is the liberation of great quantities of heat and a decided scavenging action, thus purifying the iron and prolonging its fluidity. It may therefore be expected that castings will be softer and more dense, as feeding through the gates and risers will be prolonged and the formation of combined carbon will be correspondingly retarded.

Tests of iron showing a transverse strength of 2,090 lb. gave, with an addition of ferro-cerium alloy in quantities of 0.05 to 0.15 per cent, transverse strengths of 2,450 to 2,840 lb. In a pig and scrap mixture the transverse strength of 2,740 lb. was raised to that of 3,110 to 3,280 lb. by the addition of the same amounts of the alloy. With like treatment of melted car wheels the transverse strength of 3,790 lb. was raised to that of 4,080 to 4,190 lb. In this latter test the last bar tested was defective and the ones tested contained 0.05 and 0.10 per cent respectively of the alloy.

Chill blocks cast from the above samples were quite instructive as the fractures indicated a prolonged setting period for the metal treated with cerium.

It is one of the noticeable features of the use of this alloy that much slag is taken from the molten metal, partly through the increase of fluidity and the balance from oxidation products of the alloy itself.—*Iron Age.*

EDITORIALS

The Responsibility for Increased Production

IT HAS become the custom to say that the one thing we need is more production. But this is about as unsatisfactory as to tell a starving man in a desolate country that all he needs is bread, without telling him how and where to get it.

There are so many phases to the production problem that it is not so simple as it seems. The unprecedented demand for labor and all its products has warped our vision in many ways. We now speak of millions as lightly as we formerly mentioned thousands. We shrug our shoulders and protest at the ever-mounting prices of nearly all commodities but we rarely deny ourselves on that account so long as we have the money to pay for what we want—whether we actually need it or not.

We have lost our perspective in too many cases. We have also lost sight of the fundamentals of economics. The worker, seeing the vast fortunes made on war contracts, has come to believe that capital is a limitless source of supply for his wage demands. The tradesman follows suit and marks up the prices of food, clothing, etc., so that the higher wage buys no more than before. We have become careless of values—and prices in too many cases bear no direct relation to the cost of production. They are rather based on the old piratical custom of "levying all the toll the traffic will bear."

High wages have not brought increased production. In some cases they have merely aided careless spending. But this is also true of the business man whose income has suddenly increased to an unexpected figure. How many of us would spend as sanely as we do if the Rockefeller income was suddenly added to our bank account?

We need to get back to first principles, to realize that more production means more to be distributed. And we must make this plain to the workers in every industry. As long as they believe that an increased product does not benefit them, there is no hope of, or no reason for them to increase their output.

Production today is not so much a question of machine equipment as it is of men, and of the psychology of handling them—not by strong-arm methods, or master-and-man paternalism, but by getting together on some common ground. Little can be done without a bond of sympathy and confidence between the workers and the management.

Production has fallen off in many places. But this reflects on the management as well as on the men because there are shops in which it has increased, and this without the incentive of bonuses or special inducements.

The White Motor Co. has increased the output per man without any bonus; wages, of course, keeping pace with the increasing cost of living as must be the case. The plant of the Oneida Community also reports an increased output per man. Here wages have remained the same as before the war but the increased cost of living is met by a special payment based on Bradstreet's reports.

Similar reports come from well-known plants where the bonus is used to induce promptness in the morning and steady work, and here it is interesting to note that the increased output per man is astonishingly high. But with or without bonuses, confidence must be established and this can only be done by fair treatment, and a desire to understand the other fellow's problems. Bonuses or high wages alone, with confidence lacking, will not secure the desired results. We have had too much of the "armed truce" attitude with both sides waiting and looking for chances to put something over.

With the establishment of confidence, problems of hours, rates and the like can be settled amicably and without hard feeling. Piece rates and bonuses can be adjusted either up or down as occasion requires and many of the reasons for small production can be eliminated.

Bearing in mind that the world needs more production than ever before, it must be clear to all that relief can only come by increasing it in all necessary lines—but it cannot be increased by either side alone. The worker who delays production is guilty of a crime against humanity in general. But equally guilty is the manager whose methods have failed to inspire the confidence and secure the co-operation of his men.

Management today is facing greater problems and greater responsibility than ever before. But with the examples before us of what can be done in securing co-operation and increasing production, we must hold management largely responsible when this condition is reversed. Theirs is the opportunity of inaugurating methods in keeping with the progress of the times. If they fail, other and better managers must be found, for only increased production can relieve the situation.

A Shop Mathematician

ONE of the developments of the war, at least the idea seems to have been developed in a war work shop, has been the creation of a new office or position known as the shop mathematician. His duty is to assist toolmakers and all others in any and all calculations which come up in their regular work.

The shop mathematician goes over all blueprints and drawings and helps interpret them in the clearest way possible to the toolmakers and other workmen. A part of the shop mathematician's job is calculating for laying out angles, with or without the sine bar; checking the center distance of holes; measuring threads by the three-wire system, pitch diameter of screws, etc. He does not take all work of this kind out of the toolmakers' hands unless they need or desire it, but he goes over it with them and checks it up. This has been found to aid materially in preventing costly errors and spoiled work. It has saved time and is a help in every way.

Sparks from the World's

By E. C. Porter,

Initial Flight of the New Aërial "Flivver"

The aërial "flivver" has arrived. It made its initial flight over the muddy reaches of College Point, L. I., yesterday in view of a large number of aëronautic enthusiasts. The new flivver is a tiny monoplane, said to be one of the smallest in the world, with a wing spread of but twenty-five feet. Its manufacturer has named it "Butterfly."

The Butterfly is designed for the sportsman aviator and will retail at $2,500. It carries one person only, and despite its Liliputian dimensions flew with ease.

Captain Jack Foote, chief test pilot of the L. W. F. Corporation, took the fledgling into the air for the first flight, which was witnessed by representatives of the Manufacturers' Aircraft Association and the American Flying Club.

The tiny monoplane "took off" from the snow-covered field after a short run of seventy-five feet. It mounted the air rapidly and reached a speed of seventy-two miles an hour. After circling the field a number of times Captain Foote returned to a perfect landing, coming to a dead stop after a run of fifty feet. In this he was assisted by the skid digging deep into the snow.

The new aërial "flivver" weighs only 595 lb. when empty and but 918 lb. fully loaded. It is equipped with foolproof controls and a fire extinguisher. Its motive power consists of a new type of two-cylinder motor especially designed for it. The cylinders are horizontally opposed.

Owing to its small size and low landing speed the Butterfly can be landed on the grounds of almost any country house and can be housed in any moderate-sized garage.

Lieutenant-Commander Peterson of the Sales Division of the Navy

The sales division of the United States Navy in charge of the disposition of the surplus naval equipment, negotiated sales during December, 1919, aggregating approximately $350,000 for each working day of the month, according to Lieutenant-Commander C. G. Peterson, in charge of the sales board of the Navy.

More than $200,000,000 worth of material and equipment, which has been declared surplus for the needs of the United States Navy, is being offered for sale.

Lieutenant-Commander Peterson, who is in charge of the Washington office and six district sales offices, is a mechanical engineer and has had much experience in the manufacture and sale of naval equipment. After his graduation from Cornell University in 1906, he became associated with the Sizer Ford Company, of Buffalo, manufacturer of steel and iron forgings. He later became connected with the Watertown Engine Company.

LIEUT.-COMMANDER C. G. PETERSON

As an executive in the Washington Block Company, of Lockport, N. Y., Commander Peterson acquired much information and experience that served him well as director of the sales of the Navy. Prior to his being commissioned in the Navy, Commander Peterson was with the Griscom-Russell Company.

Polytechnic Institute Gets Government Machine Tools

The mechanical engineering department of Polytechnic Institute, Brooklyn, N. Y., has announced that, under the provisions of the Caldwell act, recently passed by Congress, it has purchased apparatus at a discount of 85 per cent.

The "Tech" has to date acquired six engine lathes, a planing machine, power hacksaw, milling machine, drilling machine, universal grinding machine, radial drilling machine, two turret lathes and a shaping machine. This is all practically new.

Mr. Wade, in charge of the machine shop, personally inspected all of this machinery in trips to Detroit, Cleveland, Pittsburgh, Toledo, Buffalo, Rochester and Bridgeport. To make room for the new machinery much of the old will be done away with.

Instruction of Enlisted Men in Occupational Lines

The war plans division of the United States Army has begun to map out a comprehensive program for the instruction of enlisted men along occupational lines. More than 90,000 men in the army in approximately 250 different schools are to receive instruction in technical vocations. When completely developed it is anticipated that the system will co-ordinate with the educational and vocational activities of the army in such a way as to fit men for effective military service as well as for success in civil life.

Arrangements are now being made to transfer from the surplus equipment of the army to each divisional camp and training center such tools, equipment and supplies as may be needed and available for training purposes.

In this connection the education and recreation branch of the war plans division has established an office, the purpose of which will be to select and allocate to the various schools such machine tools and shop equipment held surplus by the War Department as will be needed for instruction purposes.

V. C. Kylberg, formerly with the machine-tool section, Office of the Director of Sales, War Department, will have charge of the selection and allocation of such material. Mr. Kylberg will be assisted in this work by Major Charles R. Welch and Major O. H. Stiles, who were also formerly with the Office of the Director of Sales. Colonel George M. Robinson, U. S. Army, will serve in an advisory capacity in the new office.

In addition to allocating to the schools the material and equipment necessary for competent instruction, much of the work of mapping out practical curricula will devolve upon Mr. Kylberg's office, according to present plans. In this connection, Mr. Kylberg is contemplating enlisting the aid and co-operation of the trade.

It is also anticipated that such equipment as may not be obtainable from among the surplus property of the various army bureaus will be purchased upon the open market.

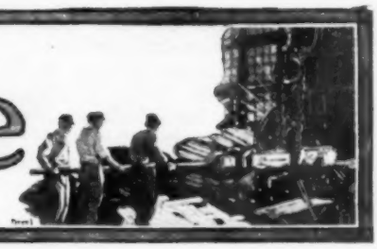
For the fiscal year ending June 30, 1920, Congress appropriated $2,000,000 for army occupational instruction.

While complete details for instruction in all the schools have not yet been developed, it is expected that the first shop in a divisional camp will be at Camp Taylor.

Instruction in all the camps and schools will be under the general direction of Dean F. H. Evans.

Industrial Forge

News Editor



Company Organization To Make Machine Tools

The Davis & Thompson Company, of Milwaukee, has been incorporated to manufacture machine tools and other metal-working machinery, principally a continuous milling machine which has been developed in the last three years by Frank M. Davis and John Thompson. Both were formerly principal officers of the Davis Manufacturing Company, Milwaukee, which now is operated as the motor works of the Avery Company, Peoria, Ill. A new plant will be erected in West Allis in the spring by the new corporation, which until now has been manufacturing its tools under contract.

German War-Blind Working in Machine Shops

Germany is striving to make useful workers of her war-blind and war-maimed. They have succeeded to such an extent that today, it is reported, a considerable number are engaged in different works running machines.

Today these works believe that they have given an answer to any idea that the war-blind or the war-maimed, except in extraordinary cases, need be solely objects of charity and pity.

Working on their drills, presses, and boring machines re men totally blinded, and in some cases with an arm missing.

Utilization of such cripples has been made possible through application of special machinery. Special attachments were contrived, so that there was no danger to the operator. This company has found that with some kinds of drills, a blind man could operate a pair.

For instance, certain lathes were equipped with bells which told the blind operator when the material in the lathe had been sufficiently turned. On this machine and on drills and the like there were special guards which prevented the workman from catching his hands in the mechanism.

New Westinghouse District Manager for New York

Arthur Elliot Allen has been appointed district manager at New York for the Westinghouse Electric and Manufacturing Company to succeed Edward D. Kilburn, who has been elected vice president and general manager of the Westinghouse Electric International Company.

Mr. Allen is a native of Toronto, Canada, and received his education in England and also in this country. On Dec. 1, 1915 Mr. Allen was appointed manager of the supply division of the New York office, which position he retained until he joined the Canadian Overseas Forces as a private in October, 1917. Later he was sent to the Canadian Officers' Training Camp, was

ARTHUR ELLIOT ALLEN

commissioned as Second Lieutenant in the Royal Flying Corps.

After being honorably discharged from the army Mr. Allen returned to the New York office of the Westinghouse company as executive assistant to the manager.

Nicholson File Company Elects Officers for Ensuing Year

At the annual meeting of the Nicholson File Company, held at the offices of the Company, 23 Acorn St., Providence, R. I., last week, the following directors were elected for the ensuing year: Samuel M. Nicholson, Paul C. Nicholson, Marsden J. Perry, John Russell Gladding, Byron S. Watson, Ernest S. Craig and Augustus E. Saunders.

At a subsequent meeting of the board of directors the following officers were chosen: President and general manager, Samuel M. Nicholson; vice president and treasurer, Paul C. Nicholson; secretary and assistant general manager, Ernest S. Craig; assistant treasurer and cashier, Henry W. Harman; assistant treasurer, Albert J. Dana; assistant secretary and manager of credits, Augustus E. Saunders; domestic sales manager, Wallace L. Pond; foreign sales manager, S. Foster Hunt; assistant to president, Robert W. Hathaway.

Trade Currents From New York, Cleveland and Chicago

New York Letter

The quietness that has prevailed in New York machine-tool circles continues. Large lists that were confidently expected to be issued about this time are still being held in abeyance by the interests affected, and representative machine-tool men hesitate to venture a prophecy as to their appearance.

To date, the same heavy volume of business that opened the year is continuing. There is some apprehension as to a possible falling off in this volume due to rumors from the financial district that capital will be hard to obtain for industrial expansion purposes.

Opposite views prevail in some quarters, however, due to encouraging reports from manufacturing interests relative to coming increased production, thus the uncertain are now in evidence.

Railroads of the Atlantic region have not inquired to any extent in the New York market, but a number of sales to Southern and Southwestern railroads for comparatively small amounts have been reported.

The used-tool men report a gain in sales over the last week with inquiries coming in in increasing numbers. Great numbers of Government tools have made their appearance on used-tool dealers' floors, and move quite rapidly.

Railroad deliveries have had a somewhat adverse effect on local movements. One concern has been waiting ten weeks for a shipment from Chicago.

Difficulty in securing motors, ranging in size from ¾ to 1½ hp., is affecting somewhat sales of equipment that take this type of motor, for which there is a very heavy demand.

Cleveland Letter

Extensive buying featured the machine-tool situation here during the past week, most of the sales made being culminations of inquiries sent out some time ago. This turn of the market is ascribed to the impending price advances, and a desire on the part of the consumer to cover his future machine-tool needs before any further change in the already poor delivery situation.

Although the market is unsettled, due to a number of factors, it is known that a number of the larger machine-tool users have plans approaching exe-

cution that will call for heavy purchases of machine-tool equipment.

One of the larger projects is that of the Brown Body Company which will undertake the immediate construction of a plant to produce bodies for automobiles, trucks and commercial vehicles. A six-acre site in the East Cleveland industrial district has been acquired, and a $350,000 unit will be erected as a start.

The Vahan Products Company plant has been taken over by the Domestic Electric Company and will be operated by the latter in connection with its present plant in the Whitney power block, and another at Newark, Ohio.

A $60,000,000 amalgamation of the Eaton Axle Company and the Standard Parts interests will be headed by J. O. Eaton, of the former concern. The new enterprise is said to have the backing of prominent banking interests, and will be the largest concern in the country manufacturing automobile springs, axles, bearings and rims in its field.

The Cleveland office of the Wolcott Lathe Company, Jackson, Mich., has taken over all of the western Pennsylvania territory formerly handled from Pittsburg. Frank H. Wheaton, Cleveland manager, will increase his staff in order to cover the additional territory thoroughly.

The Co-operative Machinery Company, formerly located in the Marion building, has taken quarters in the Vulcan building in order to secure sufficient space in which to transact its increased business. F. A. Maxwell is in charge of this office.

Dean S. Hazen, formerly assistant advertising manager of the National Acme Company, has entered the real-estate-publicity field.

Chicago Letter

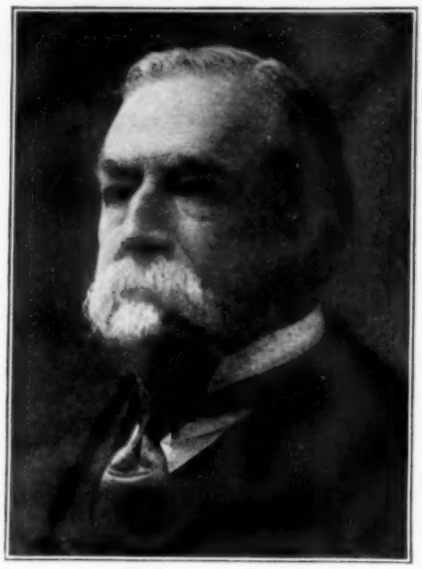
Less activity at present prevails in the local machinery trade than has been apparent for the past three months. With but one exception, dealers all state that sales and inquiries show a decided falling off, the one exception reporting business so far this month on a par with that of December and January. This slump is attributed largely to prevailing exchange conditions, the average buyer being reluctant to place orders in the face of what seems to him to be excellent reasons for expecting lower prices.

Deliveries remain, in most cases, very poor. Many items scheduled for February delivery are running over into March, this condition applying to probably 20 per cent of the goods so scheduled. All tools on back order, when delivered, are being eagerly taken by the buyers, there having been practically no cancellations.

Recent business continues to be widely diversified. Sales of interest to the trade include over ten thousand dollars worth of hardening and annealing furnaces to an auto builder; a quantity of heavy-duty drilling, and milling machines to a maker of automobile axles; and numerous gear-cutting, and drilling machines, hacksaws and milling machines to builders of washing machines. Talking-machine people, who have been buying great quantities of parts from outside sources, are equipping their own plants so as to render such outside buying unnecessary.

Anatole Mallet

Anatole Mallet, honorary member of the American Society of Mechanical Engineers, died in Nice, France, in October, 1919. He was one of the few men whose name became the designation of a standard type of apparatus in a great industry. Mr. Mallet was born at Carouge, in 1837. He graduated in 1858 from the Central School of Arts and Manufactures in Paris. Mr. Mallet devoted all his attention for a number of years to problems of civil engineering.



ANATOLE MALLET

In 1867 he engaged for the first time in mechanical engineering, giving particular attention to steam engines with double expansion. The first application of this system to locomotives was made in 1876, when he introduced the first two-cylinder compound locomotive, which operated on the line from Bayonne to Biarritz.

He was a member of the Society of Civil Engineers of France, the Society for the Encouragement of National Industry of France, and the Franklin Institute of Philadelphia. The French Society of Civil Engineers awarded him the Schneider prize in 1902, and the annual prizes in 1909 and 1911. He was made a Knight of the Legion of Honor in 1885 and promoted to Officer in 1905. The Institution of Mechanical Engineers of London awarded him a gold medal in 1915.

In addition to carrying on important engineering work, Mr. Mallet took an active part in the work of the French Society of Civil Engineers. From 1880 to within a few months of his death he was editor of the Chronicle of the Bulletin of the Society and furnished it with numerous technical notes and important memoirs, the last of which, treating of the Practical Evolution of the Steam Engine, earned him the honors conferred by the Society.

Great Storage Plant for Coal and Power Suggested for Newark Meadows

Under a plan presented last week at the convention of the American Institute of Mining and Metallurgical Engineers in the Engineering Societies' Building, by Edwin Ludlow, consulting engineer and former vice president of the Lehigh Coal and Navigation Company, New York City would be assured of abundant fuel supply during storms or transportation tie-ups such as were met with in recent weeks.

Mr. Ludlow suggested in the course of his address on "Conservation of Bituminous Coal" that the Newark meadows be made the point for the location of a great storage plant for soft coal which would serve not only New York City but every important industrial center along the Atlantic Coast.

In addition, he would erect a huge power plant there which would connect with the present generating plants of the Edison, Interborough, Brooklyn Rapid Transit and other large consumers of electricity. This power plant, he explained, would serve as a central agency for the distribution of electric current to Atlantic states industries at a greatly reduced cost. Connection with the generating plants would be established by high-power trunk lines.

"No large storage can be maintained on Manhattan Island, with its limited area and high cost of land," Mr. Ludlow said. "The Newark meadows, however, furnish a location easily reached by all coal-carrying roads coming into the neighborhood of New York, and also on tidewater, where coal can be brought from Norfolk or Baltimore. A central power plant erected there could have unlimited storage, and where coal could be brought in at the minimum of expense and unloaded on these storage piles."

With the successful operation of the central power plant at Newark he predicted that similar plants would be built at Baltimore, Philadelphia, Boston and Providence. By connecting them all with the proposed main trunk line he said intermediate industries would receive their electric power at the minimum of cost.

Liquidation of War Contracts

The value of contracts reported liquidated to Jan. 31 is estimated at $2,247,622,000.

Contracts liquidated consist of 18,925 formal contracts valued at $1,231,287,000 and 4,981 informal agreements valued at $1,016,335,000. It has cost $281,530,000 to liquidate these contracts. In addition partial payments amounting to $97,184,000 have been made on other contracts, making the total amount paid in liquidation $378,714,000.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Mill, Vertical Boring and Turning

J. Buckton & Co., Ltd., Leeds, England.

"American Machinist," (English Edition), Jan. 17, 1920

For wheel centers and similar work up to a diameter of 5 ft. Work table is 66 in. in diameter, fitted with 5-jaw chuck. Table spindle runs in adjustable bearings and is provided with footstep to take load. Table runs on a circular sliding way which is continuously under oil level. Drive is by 25-hp. motor at 300 to 900 r.p.m., through spur gearing and bevels; final drive by spiral gear. All driving gears run in oil and are of steel, except gear ring under table which is cast iron. Table runs at any speed from 1¼ to 33⅓ r.p.m. Cross-slide has square guide ways; work 20 in. high can be admitted. The two stool slides are balanced and provided with self-acting feed motions for horizontal, vertical and angular cuts. Four feeds to each tool slide can be stopped, started, reversed or varied, independently.

Surfacing Machine, Hand Feed

Wadkins & Co., Leicester, England.

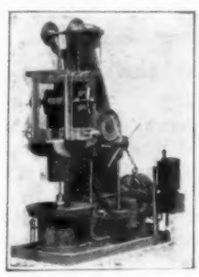
"American Machinist" (English Edition), Jan. 24, 1920

Made in two sizes. Small machine used on bench or on a column driven by motor or countershaft. Cutter-block is 8 in. wide; work tables are 3 ft. 10 in. overall. Steel lips secured by screws to tables, reducing width of gap at cutter-block. Tables raised or lowered independently; fence can be fixed in any position across full width of cutters, permitting rebating without change of cutter. In both machines cutter-block is two-knife circular type, accurately balanced; runs at 4,000 r.p.m. Net weight of this machine is 3 cwt. The larger machine has a cutter-block 20 in. wide, tables 8 ft. 1in. overall by 2 in. By handwheels each table can be independently raised or lowered on inclined planes while machine is running; also by screw and handle tables can be withdrawn horizontally. The fence canta from square to 45 deg. relative to table and can be instantly locked, with stops to insure its return to the square position. It has pressure springs and quick adjustment across and up to the front edge of the table; rebating possible without change of cutter Weight, 2,100 lb.

Drilling Machines, Inverted

Foote-Burt Co., Cleveland, Ohio.

"American Machinist," Jan. 29, 1920

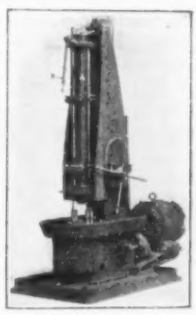


This machine was built for drilling 1½ in. hole, 30 in. deep, through tool-steel billet. The billet is lowered through the top of the work-holding cage and clamped centrally in position by hand-operated vise jaws. A swinging door at the top of the frame carries a heavy pressure screw which is brought down against the billet to take the end-thrust of the drill. The spindle on machine has no vertical movement and feed is obtained by lowering the work-holding fixture, which is mounted on a saddle sliding on vertical ways of the column. Counterweights are used to compensate the weight. An oil-tube drill is used and coolant which is contained in a reservoir in the base is fed constantly by a pump to the cutting point of the drill.

Drilling Machine, Inverted

Foote-Burt Co., Cleveland, Ohio.

"American Machinist," Jan. 29, 1920

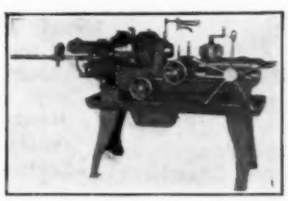


This machine performs three separate functions; it is provided with the jig A with trunnions at each end, about which it is revolved by releasing the locking lever B. There are nine spindles arranged in groups of three. The first spots for the drills, the second drills and the third reams the holes. While the jig head is feeding the three loaded sides to the tools the operator is loading the fourth side, and he has only time to complete this while the machining is in progress, and then revolves the jig 90 deg. and repeats the operation.

Screw Machine, No. 2 Friction-Head

Millholland Machine Co., Indianapolis, Ind.

"American Machinist," Feb. 5, 1920

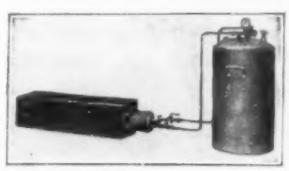


Chuck capacity, 1 in.; hole in spindle, 1 3/16 in.; holes in turret, 1½ in.; swing over turret slide, 4⅜ in.; length turned, 7 in.; greatest distance end of spindle to turret, 15 in.; swing over bed, 14 in.; swing over cut-off, 7 in.; spindle bearings, front 2¼ x 4¼ in., rear 2 x 3½ in.; lever movement of cutoff, 5½ in.; belt for cone, 2¾ in.; pulleys on countershaft, 10 x 14 in.; width of belt for countershaft, 3 in.; floor space, 60 x 26 in.; extension feed rod, 47½ in.; weight, net 1,300 lb., crated 1,500 lb., boxed for export 1,710 lb.

Heater, Hauck No. 2F Ladle

Hauck Manufacturing Co., Brooklyn, New York.

"American Machinist," Feb. 5, 1920

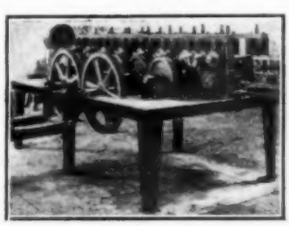


The outfit consists of a sheet-iron firebox and a 20-gal. steel fuel tank. The number of openings varies, as firebox is made in different lengths. The burner is provided with a regulating valve designed to consume any grade of fuel oil, crude oil, or kerosene, delivered under a pressure of 20 to 100 lb. per square inch. Tank containing oil is charged with compressed air and has a gage and regulating valve for oil and air. Pipe connections between firebox and tank are of a length to suit conditions.

Rolling Mill, Molding and Tube

United Machine and Manufacturing Co., Canton, Ohio.

"American Machinist," Feb. 5, 1920

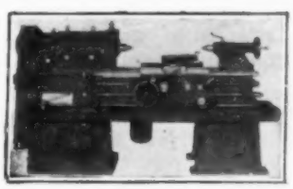


The rolling mill has a capacity to roll tube and molding sections at 60 to 300 ft. per minute. Maximum width developed, 13 in. Upper and lower spindles are power driven. The feeding-in device is a set of horizontal tool-steel rolls hardened and ground, mounted in phosphor-bronze bearings. Different widths of stock are guided into the die rolls by vertical grooved rolls of feeding-in device, which are mounted on spindles carried on an adjustable cross-slide. Roll bearing blocks are mounted in housings that can be adjusted transversely without changing vertical adjustment of the rolls.

Lathe, 14-In. Geared-Head

Reed-Prentice Co., Worcester Mass.

"American Machinist, Feb. 5, 1920



Specifications: Spindle bearings (front, 2½ x 5 in.; rear, 1 3-16 x 3 in.); hole through spindle 1½ in.; taper hole, Jarno, No. 4; number of speeds, eight; number of feeds (44), 0.0045 to 0.0667 in.; threads cut, 4 to 60; taper attachment will allow turning 18 in. at one setting; will turn 26⅛ in. long with 6-ft. bed; floor space, 41½ x 91 in.; weight (net, 2,800 lb.; boxed, 3,200 lb.).

Clip, paste on 3 x 5-in. cards and file as desired

Obituary

PIERREPONT BIGELOW, treasurer of the Bigelow Company, New Haven, Conn., manufacturers of boilers and plate-iron products, died at his home on Briar Lane, New Haven, Jan. 27, after a brief illness.

ARTHUR D. HAWLEY, president of the Bristol Manufacturing Company, Bristol, Conn., died at the Hartford Hospital, Feb. 8, from pneumonia. Mr. Hawley has been with this company for several years and was also a director of the Bristol National Bank.

JOSEPH M. FLANNERY, known as a producer of vanadium and radium, died at his home in Pittsburgh, Pa., on Feb. 14, 1920. He was 53 years old. Mr. Flannery obtained control of a vast supply of vanadium in Peru many years ago and later with a number of business associates developed the radium deposits of Colorado and Utah. He was an organizer of the American Vanadium Company and president of the Standard Chemical Company. He furnished the United States Government with large quantities of radium for use during the war. More than $1,000,000 is said to have been spent by Mr. Flannery before he perfected his radium processes.

Personals

WILLIAM GWILYM, for the past four years general foreman of the Waterville Machine Works, Waterbury, Conn., has resigned his position.

C. W. ELTON, formerly with the T. H. Mathews Company, has resigned to accept a position as general manager of the Pittsburgh Steel Stamp Co., Inc., Pittsburgh, Pa.

M. R. CARSON, former sales engineer of the Swind Machinery Company, has accepted a position with the Monarch Machinery Company, 300 North 3rd St., Philadelphia, Pa.

ELISHA H. COOPER, secretary of the Fafnir Bearing Company, New Britain, Conn., has been appointed a director of the Savings Bank of New Britain, Conn.

RICHARD CUSHMAN, treasurer of the Cushman Church Company, Hartford, Conn., has been appointed to the board of directors of the Colonial National Bank, Hartford, Conn.

J. D. APGAR, formerly of the Machine Tool Engineering Company, New York City, has joined the sales force of the Van Norman Machine Tool Company, Springfield, Mass., and will be its direct representative in the New York office, 320 Fifth Ave.

CHARLES KEENAN, auditor of the Clinton - Wright Wire Company, Worcester, Mass., has resigned his position with this company. He was formerly with the Morgan Spring Company, Worcester, for fourteen years as its credit manager.

B. C. SAUNDERS, formerly sales manager of the Wilmarth & Morman Company, has resigned his position and is now associated with the Grand Rapids Grinding Machine Company, Grand Rapids, Mich. Mr. Saunders has purchased an interest in this company. At the annual meeting of the board of directors of this company Mr. Saunders was elected secretary and sales manager.

CHARLES D. WRIGHT has resigned his position as master mechanic in the rolling mills of the Bethlehem Steel Company's local plant at Harrisburg, Pa., and left Feb. 15 to take a position with the American Tube and Stamping Company at Bridgeport, Conn. He will be assistant general superintendent of the Bridgeport plant. Mr. Wright has been connected with the local plant as a master mechanic for the past four years.

Officers Elected by the Norton Company

The Norton Company, Worcester, Mass., at its adjourned annual meeting last week, elected the following officers: President and general manager, Charles L. Allen; chairman of the board of directors, George I. Alden; treasurer and general counsel, Aldus C. Higgins; secretary and works manager, George N. Jeppson; directors, the foregoing and R. Sanford Riley and John Jeppson. The other officers are appointed by the directors, and there is no change in the list as announced at the time of the reorganization July 1.

C. E. Hildreth Made Vice President

Charles E. Hildreth, president and general manager of the Whitcomb-Blaisdell Machine Tool Company and president of Worcester Chamber of Commerce, has been elected vice president of the New England Foundrymen's association.

Business Items

The Billings & Spencer Co., of Hartford, Conn., at a recent directors' meeting, announced the election of J. B. Sehl, formerly factory manager, to the office of second vice president, and A. W. Gray to assistant treasurer.

Gardner-Bryan Co., Cleveland, Ohio, has been appointed special representative for the Precision and Thread Grinder Manufacturing Company, Philadelphia, Pa., in Ohio, Indiana and western Pennsylvania.

The Lyons Metal and Tool Co., New Haven, Conn., has been organized to deal in tool, mill, hardware, specialties, etc. The incorporators are: G. E. Lyons, West Haven, Conn.; J. Wm. Moffatt, New Haven, and Ernest Gregory, Derby, Conn.

The Irving Iron Works Co., Long Island City, N. Y., has been awarded the contract for supplying all flooring, grating, walkways, and ladder steps for the two new superdreadnaughts "California" and "Tennessee." The terms of this contract demand that the grating shall be galvanized throughout.

Stuart W. Webb, Henry P. Kendall, John N. Bruce, Fred R. Ayer, Henry J. Guild and Charles B. Wiggin have formed a company under the name of Webb, Kendall & Bruce, Inc., with offices at 65 Broadway, New York, and 199 Washington St., Boston, Mass., for the purpose of consulting industrial management problems.

Henry Prentiss & Co., New York, is establishing branch offices in Hartford, Conn., to take care of its rapidly increasing business in that section and has secured quarters in the Hartford Trust Building, 750 Main St. L. P. Goodspeed of its main office in New York will be in charge with T. I. Shriver as his assistant.

Hodson-Feenaughty Company, of Portland, Oregon, which handles contractors' equipment, has changed its name to the Feenaughty Machinery Co. The officers of the company are: W. O. Feenaughty, president and general manager; E. L. Thompson, vice president; J. I. Overman, secretary and sales manager. C. W. Hodson has retired from the firm.

The business of manufacturing and selling Delco-Light products heretofore conducted by the Domestic Engineering Co., Dayton, Ohio, has been transferred to the General Motors Corporation. For the present this business will be conducted by the Delco Light Company and in the future all mail addressed to the Domestic Engineering Company should go to the Delco Light Company.

The New England Brass and Foundry Co., Worcester, Mass., was recently incorporated to do a general foundry business. This new company is a subsidiary of the Coppus Engineering and Equipment Co., Worcester, Mass. The headquarters of the new concern will be located in the new foundry building now being erected on Park Ave., Worcester, Mass. The president and treasurer of the company is F. H. Coppus, who is president of the Coppus Engineering and Equipment Co.

The American Machine and Manufacturing Company, maker of oil mill machinery, has consolidated its Greenville, S. C., and Atlanta plants. Hereafter the company's main plant, in fact the only manufacturing establishment it operates, will be located in Atlanta, Ga., and branch offices will be maintained in other cities. Transfer of the company's entire equipment from Greenville has now been completed. This company's principal product is oil mill machinery. During the war the company produced shells for the Government. The Atlanta plant now comprises a machine shop, foundry, warehouse and general offices.

Condensed-Clipping Index of Equipment

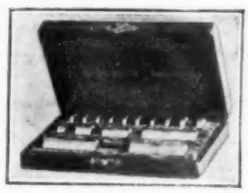
Patented Aug. 20, 1918

Blocks, Round Master

Wilton Tool and Manufacturing Co., 84 Linden Park St., Boston, Mass.

"American Machinist," Feb. 5, 1920

A series of round master gage blocks put up in sets of different combinations. The illustration shows set "H" comprising 16 blocks varying from 0.100 to 2.00 in., the variations being such as to give all dimensions by thousandths from 0.400 to 8 in. Other sets give dimensions from $\frac{1}{16}$ to $1\frac{15}{16}$ in. by sixteenths; 0.10 to 2.10 by tenths, and 1 to 41 mm. by millimeters. It is claimed that these gages are accurate to within 0.000015 in.

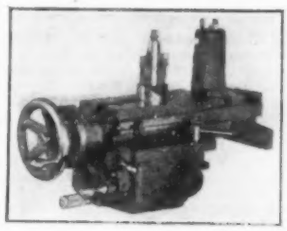


Cutoff, Screw Machine Power

Millholland Machine Co., Indianapolis, Ind.

"American Machinist," Feb. 5, 1920

It is intended for use when it is desired to do facing and forming while the turret tools are in operation. Has a simple powerful friction drive. An automatic stop is tripped by either of two adjustable dogs. Hand trip lever can be used when desired. Dial is graduated in thousandths and provided with clips for quick reading. Eight feed changes in both directions are through the feed-box. Lower lever is used to reverse the power feed in either direction.



Drilling Machine, Automatic

Avey Drilling Machine Co., Cincinnati, Ohio.

"American Machinist," Feb. 5, 1920

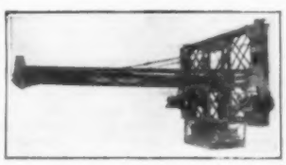
The machine can be furnished in the gang type having from two to six spindles. Can be used as an automatic, semi-automatic or plain hand feed machine. Spindle can be advanced by hand ahead of power feed without disengaging the latter, and the clutches will pick up the power feed wherever the hand feed is dropped. Counterweight can be regulated to accommodate different weights of tools. Hand feed lever has a ratchet device whereby it can be set in any relation to the spindle or disengaged so as to remain idle when the automatic feed is in use. Specifications: Stroke, variable from $\frac{3}{4}$ to 5 in.; maximum number of strokes per min., 30; speeds, 4; feeds, 4; capacity, $\frac{3}{4}$ in. in cast iron, $\frac{1}{2}$ in. in steel; maximum spindle speed, 3,500 r.p.m.

Crane, Traveling Wall

Toledo Bridge and Crane Co., Toledo, Ohio.

"American Machinist," Feb. 5, 1920

It is made in two sizes with capacities of three and five tons each, both having effective reach up to 30 ft. Power for longitudinal travel by two motors connected parallel and operated through one controller. A foot brake is provided to control longitudinal travel. The location of the cage is optional or may be omitted entirely, as rope-operated controllers can be substituted. Where rope control is employed, foot brake is omitted and a solenoid brake substituted.

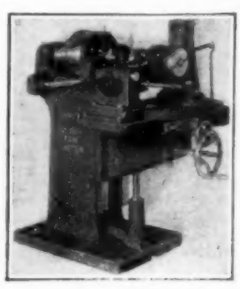


Milling Machine, Cam

Garvin Machine Co., New York, N. Y.

"American Machinist," Feb. 5, 1920

The machine is designed for cutting flat or cylindrical cams. Capacity, any type of cam, 1 in. to 12 in.; taper hole in spindle, No. 10 B. & S.; size of cutters, $\frac{1}{8}$ to 2 in.; number of feed changes by four-step friction cone pulley, 8; cylinder cam throw, $9\frac{1}{4}$ in.; flat cam throw, 6 in.; number of feed changes on flat fixture only, 3; number of feed changes on cylindrical fixture, 2; swing of cylindrical fixture, $12\frac{7}{8}$ in.; speed of friction pulleys on countershaft, 120/160; space, 44 x 54 in.; domestic shipping weight (both fixtures), 2,700 lb.

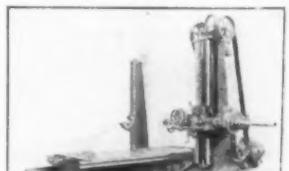


Drilling Machine, Horizontal

Milwaukee Electric Crane and Manufacturing Co., Milwaukee, Wis.

"American Machinist," Feb. 5, 1920

Horizontal drilling machines cover a wide range of drilling and boring, especially suited for operating on pieces too long or bulky for the usual type of machine. Specifications: Spindle front bearing, $2\frac{1}{2}$ x $7\frac{1}{2}$ in.; spindle rear bearing, $2\frac{1}{2}$ x 6 in.; spindle driving end, $2\frac{1}{4}$ in.; spindle Morse taper, 5 in.; spindle speeds, standard, 20-400; spindle feeds, six; spindle feed, 24 in.; spindle quill diameter, $4\frac{1}{2}$ in.; spindle elevation, minimum to table, 3 in.; spindle elevation, maximum to table, 60 in.; table, width by length, 1 x 9 ft.; column movement on base, 24 in.; run of table on bed, 9 ft. 6 in.; run of column on slide, portable, 6 ft.; length of column slide, portable, 10 ft. 3 in.; variable-speed motor, $3\frac{1}{2}$ hp.



Joint, Ream Universal

R. S. Manufacturing Co., Kansas City, Mo.

"American Machinist," Feb. 5, 1920

Employs a flexible member having six lugs arranged to engage a like number of rollers mounted upon the inner portion of the case. Is intended to combine universal action of a ball-and-socket joint with anti-friction qualities of a roller bearing. Is made from drop forgings and bar stock. Rollers and the curved surfaces of the lugs are hardened and ground. Device is balanced, and said to be free from backlash and to withstand end thrust without injury. Mechanism is dustproof and waterprooof and is packed in grease.

Truck, Haskell Shop

H. Haskell Manufacturing Co., Pawtucket, R. I.

"American Machinist," Feb. 5, 1920

The body of the truck is made from $\frac{1}{8}$-in. stock, reinforced at the inside corners with heavy angle irons. The axle is made from a steel bar $1\frac{7}{8}$ x $1\frac{1}{2}$ in., the wheel bearings being turned to $1\frac{7}{16}$-in. diameter. The truck is made in one size only. Dimensions: Height, 26 in.; length, 44 in.; width, 26 in.; body, 21 x 31 in., by 13 in. deep; side wheels, 20 in. in diameter with $2\frac{1}{4}$-in. face; front wheel, 7 in. in diameter with $2\frac{1}{4}$-in. face; cubical contents of body, $3\frac{3}{4}$ cu. ft.; net weight, 300 lb.

Clip, paste on 3 x 5-in. cards and file as desired

New Publications

Millwrighting. By James F. Hobart. Four hundred fifty-four 6 x 9 in. pages, 140 illustrations. Second edition. Bound in heavy cloth boards. Published by the McGraw-Hill Book Co., 239 West 39th St., N. Y.

This book is a very thorough one and covers the subjects which a millwright needs to know in a masterly way. Each chapter is sub-divided into numerous subjects arranged in logical order. The main topics are: The Millwright and What He Is, Factory Location and Arrangement, Methods of Laying Out Buildings, Foundations and Leveling Work, Erecting Buildings and Machinery Foundations, Walls and Machinery Supports, Roofs, Strength of Materials, Shafting, Pulleys, Belts of All Kinds and Their Care, Setting Up of Machinery, Babbitting, Scraping and Lubricating, Pipe and Valve Work, Erecting Steam Engines and Their Fittings, Boiler Setting, Boiler-Room Problems, Shop Work for the Millwright, Water-Wheels, Hydraulic Rams, Automatic Sprinklers, Electric Motors—Their Placement and Problems.

Complete Practical Machinist. By Joshua Rose, M. E. 500 pages, 5 x 7¼ in., fully illustrated with drawings and diagrams.

This is a somewhat condensed revision of Mr. Rose's well-known "Machine-Shop Practice," with new matter added to bring it up to date. It contains much information that is of value to machinists, especially young machinists and those whose experience covers but a limited range.

Instructions are given for setting up and operating the machines as well as for making and using the commoner forms of tools used in the machine shop. Other chapters cover calculations on speeds of wheels and gears, and steam engine and pump repairs.

It is published by Henry Carey Baird & Co., Inc., 2 West 45th St., New York City, N. Y.

Electric Arc Cutting and Welding. Ninety 4¾ x 7¼-in. pages, thirteen pages of illustrations, paper cover. Published by the Electric Arc Cutting and Welding Co., 222 Halsey St., Newark, N. J.

This little book consists of twelve instruction papers, intended for the use of those who want to have before them definite information about arc cutting and welding. The instruction papers were originally prepared for use in the welding school operated by the company issuing the book.

The principal headings in the book are: Instructions for Setting Up and Operating, Definitions of Welding Terms and Materials, Beading Method, Spreading Method, Padding Method, Fillet Method, Butt-Welding Method, Special Butt Welding, Irregular Tube Welding, Track Welding, Sheet Patching, Heavy Section Welding, Cast-Iron Welding, Non-Ferrous Metal Welding, Pre-heating Re-heating and Annealing, Cutting with the Electric Arc, Temperature and Heat of the Arc.

Catalogs Wanted

The Turbine Air Tool Co., 301 Chamber of Commerce Building, Cleveland, Ohio, is manufacturing a line of pneumatic tools, and would be pleased to receive catalogs for its purchasing and engineering departments.

Trade Catalogs

Radbore Head. The Fairbanks Co., Broome & Lafayette Sts., New York. Catalog, pp. 8, 7 x 10 in. This catalog contains several illustrations on the Radbore head; also its price list. Type, size and grade of steel will be furnished upon application.

Side Milling Cutters, Universal Vise, Counterbores, Etc. The New Britain Tool and Manufacturing Co., New Britain, Conn., has issued a new set of circulars on the side milling cutters, universal vise, counterbores, chucking reamers, the New Britain universal dividing head, etc. Each circular gives one illustration of the machine; also its diameter, width and price.

High-Speed Steel. Onondaga Steel Co., Syracuse, N. Y. Catalog, pp. 40, 4½ x 6½ in. This company has issued a catalog describing its start in the making and selling of high-speed steel and presents some of its experiences since its organization. Information is given on quenching oils; also forging, annealing ad cutting tool lengths for high-speed steel. Several tables are given; also directions for the treatment of high-speed steel, and color chart giving an idea of the various heats required.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A government department in a country of Europe desires to receive catalogs and other literature of mechanical appliances for offices, such as calculating, adding, and numbering machines, and other labor-saving devices. No. 31,957.

The manager of an engineering firm in East Africa desires to purchase an engineering workshop, tools, materials, etc. Specifications of the initial order, which embraces the very buildings of the workshop and adjuncts, all tools and equipment, and finally also the necessary stock of materials required, may be examined at the Bureau or its district offices. (Refer to file No. 128093.) Quotations should be given f.o.b. New York. Payment, cash against documents. No. 31,958.

The water commissioners of a city in Scotland desire to purchase 850 tons of cast-iron pipe—dimensions, 15 by ⅜ inches by 12 feet—as per specifications which may be examined at the Bureau or its district offices. (Refer to file No. 130331.) Quotations should be given c.i.f. port in Scotland. No. 31,984.

A company in Bulgaria desires to purchase and secure an agency for the sale of agricultural implements of all kinds, machinery and equipment for mills, and small benzine motors from 1 to 25 hp. Quotations should be given c.i.f. Bourgas, Bulgaria. References. No. 31,988.

A firm in Bulgaria desires to purchase and secure an agency for the sale of building materials of all kinds, including iron and steel, and machinery and equipment for mills. Quotations should be given c.i.f. Bourgas, Bulgaria. References. No. 32,017.

A merchant in China desires to purchase American flour-milling machinery and equipment. He requests bids on a crude-oil engine of 60 hp. and complete milling outfit machinery that will turn out 20,000 lb. of flour a day and a crude-oil engine of 35 hp. and machinery that will turn out 10,000 lb. of flour a day. No. 32,010.

A firm in Brazil through its agent in the United States requests the representation of manufacturers of agricultural and industrial machinery, bridge material, steam and hydraulic pumps, printing machinery, railroad materials, automobiles, barbed wire, iron and steel products, tools, belting, cement, rubber tubes and tires, hardware, gasoline, kerosene, lubricating oils; also the representation of a steamship company. References. No. 31,995.

The purchase is desired by a man in India of an oil-pressing machine similar to a well-known American oil expeller, but of small capacity, of about 160 lb. of oil per day; one oil engine suited for crude oil, for working the oil expeller; one force and lift pump for drawing water from a tube well to a depth of from 50 to 80 ft.; one centrifugal pump for 8-in. pipe delivery; and one wheat-scouring machine. Quotations should be given c.i.f. port in India. Payment, cash. Catalogs, price lists, and terms for future business are desired. No. 31,867.

A merchant in Roumania desires to purchase and secure an agency for the sale of rolling mill and steel products, copper sheets, sheet-iron work, hardware of all kinds, cutlery, implements, tools, registering machines. Correspondence should be in German or French. Reference. No. 31,602.

The purchase is desired by a firm in England of 20 tons of iron bars. Reference No. 31,418.

A commercial agent from Bulgaria is in the United States for the purpose of making business connections with manufacturers only, with a view to securing an agency and purchase 500 reapers, 100 binders, 5,000 cultivators, 50 tractors, 50 thrashers, 10,000 plows, 200 mowing machines, 1,000 barrels of cottonseed oil, 500 tons of iron, 20 tons of wire nails, belting, 500 tons of iron beams, 200 tons of tinplate. References. No. 32,042.

Catalogs are desired by a man in Brazil of machinery to pulverize cement. Catalogs are also requested to be forwarded to the American consul in his district. No. 32,047.

A manufacturer in Brazil desires to purchase machinery for chain manufacturing mill, as he wishes to improve and enlarge his plant. A catalog showing types of chain already manufactured, was forwarded, and machinery for the manufacture of these and other types is wanted. This catalog may be examined at the Bureau or its district offices. (Refer to file No. 128,753.) Quotations should be given c.i.f. Santos. Payment, cash. Reference. No. 32,038.

A firm of engineers in Peru desires to secure agencies for the sale of steel and iron structural material, pipe, nails, wire, bars, tin plate, etc. No. 31,919.

A firm in Switzerland desires to purchase and secure an agency for machinery, tools, iron, steel, motor cars, trucks, tractors. Quotations should be given f.o.b. American port or c.i.f. European port. Correspondence may be in English. References. No. 32,025.

A lumberman in New Zealand desires to purchase caterpillar or crawler tractor of about 40 to 60 hp. for hauling timber, and requests catalogs and prices. Quotations should be given f.o.b. San Francisco. Payment with order. No. 32,029.

Forthcoming Meetings

The American Society for Testing Materials will hold its next annual meeting during the week of June 21, 1920, at the New Monterey Hotel, Asbury Park, N. J. This society has its headquarters in the Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa. C. L. Warwick is the secretary and treasurer.

The American Welding Society will hold its annual meeting at the Engineering Societies Building, 33 West 39th St., New York City, on Apr. 22, 1920, at 10:30 a.m. Howard C. Forbes is the secretary.

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of Eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Electric Hoist Manufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Pa.

The Material Handling Machinery Manufacturers' Association will hold its meeting in New York City on Feb. 26 and 27.

The National Motor Boat, Ship and Engine Show will be held in New York City on Feb. 20 to 28.

The National Association of Engine and Boat Manufacturers, Inc., will hold its meeting in New York City on Feb. 26.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Pa., Howard Evans, secretary, Pier 45, North Philadelphia, Pa.

Rochester Society of Technical Draftsmen. Monthly meeting last Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.

The Second Annual Aëronautical Exposition of the Manufacturers Aircraft Association, Inc., will be held at the Seventy-first Regiment Armory, 34th St. and Park Ave., New York, on Mar. 6-13, 1920. S. S. Bradley, 401 Fifth Ave., New York City, is the general manager.

Condensed-Clipping Index of Equipment

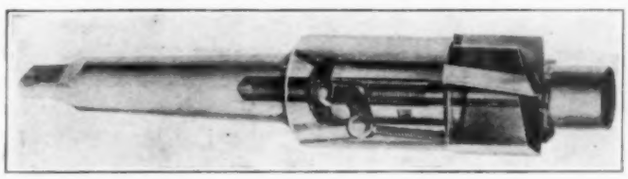
Patented Aug. 20, 1918

Counterbores, Interchangeable

Gairing Tool Co., Inc., Detroit, Mich.

"American Machinist," Feb. 12, 1920

The holders are made in four sizes known as Nos. 1, 2, 3 and 4. They will take any size of cutter from ¼ to 3 in. in diamter. Complete sets of these tools are contained in neat boxes having hinged covers. The No. 2 set is known as the fillister- and flat-



head screw set, and is suitable for use for all sizes of such screws from ¼ to ⅞ in. The No. 5 set includes two countersinks, fifteen cutters, thirty-eight pilots, three holders, and an assortment of pilot nuts and wrenches for same.

Press, Toggle Embossing

Ferracute Machine Co., Bridgeton, N. J.

"American Machinist," Feb. 12, 1920

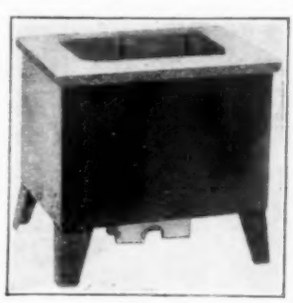
Each column is 13 in. square with a vertical 5¼-in. cored hole containing a 5-in. steel bar, the combined tensile strength of columns and bars allowing for a large safety factor over the 450-ton pressure—for which the machine has been designed. Ram has a stroke of 2 in. Distance from head to ram, when the latter is in lowest position, 20 in. A sliding die chuck is given an intermittent horizontal motion of 10 in. by a series of levers connected to the main shaft by means of a cam. The press makes 30 strokes per minute. An electric motor furnishes the drive through a raw-hide pinion engaging teeth that are cut in the rim of the flywheel. The total weight of the machine is about 18,500 pounds.

Pot, Electric Melting

General Electric Co.

"American Machinist," Feb. 12, 1920

For melting lead, babbit and similar metals; known as the 25-lb. electric metal-melter bench-type pot. Heating element is a coil, wound around the container from top to bottom, and thoroughly insulated from the outside. The automatic regulation is obtained by constructing the heating element of wire which has a positive temperature coefficient. Initial rise of current is enough to melt it quickly, but, after it is melted, the current is automatically reduced to just enough to keep it molten, but not enough to burn it. This does away with the thick scum of oxidized metal around the top.

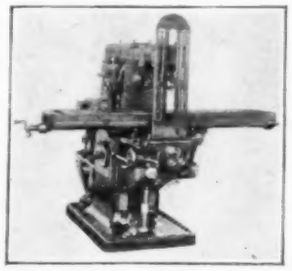


Milling Machine, Rockford No. 3 Plain

Rockford Milling Machine Co., Rockford, Ill.

"American Machinist," Feb. 19, 1920

Specifications: Table feed automatic, 34 in.; crossfeed automatic 12 in.; vertical feed, automatic, 20¾ in.; working surface of table, 15 x 62 in.; overarm, 4½ x 9½ in.; number of arbor supports, 2; center of spindle to bottom of overarm, 7½ in.; B. & S., taper hole, No. 11; hole throuh spindle, ⅞ in.; index center swing, 12 in.; index centers take in length, 40 in.; three-jaw universal chuck, 9 in.; width of vise jaws, 7½ in.; depth of vise jaws, 2¼ in.; vise opens with steel jaws, 6 in.; number of speed changes, 18; range of speed (r.p.m.), 15 to 360; number of feed changes, 14; range of feed (in inches per minute), ½ to 16; diameter of driving pulley, 16 in.; width of belt, 4 in.; speed of driving pulley (r.p.m.) 320; horsepower of electric motor, 10; net weight (in pounds) approximate, 7,200.

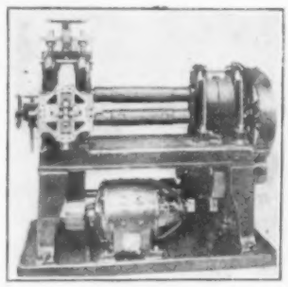


Mill, High-Speed Rolling

Standard Machinery Co., Auburn, R. I.

"American Machinist," Feb. 12, 1920

Rolling mill designed for the high-speed rolling of wire and thin-gage flat stock. Rolls are hollow, made of steel, are hardened and ground. Herringbone pinions are inclosed and run in oil. Roller bearings provided for the roll necks. A water-cooling system circulating through the bodies of the rolls keeps the surfaces cool. Power is supplied by a 5-hp. variable-speed motor; the peripheral speed of the rolls ranges from 100 to 225 ft. per minute. A special feature is the adjustable drawplate or Turk's head. Adjustments for different thicknesses of stock made by the four square-headed screws. Lateral adjustment of Turk's head, permitting entire surface of the main rolls to be used, made by the handwheel at the left.

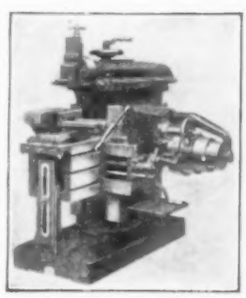


Shaping Machine, Cone Drive

Davis Machine Tool Co., Inc., Rochester, N. Y.

"American Machinist," Feb. 12, 1920

Specifications: Planes, lohg 16¾ in., wide 21 in.; maximum distance table to ram, 17½ in.; vise, between jaws, 10 in.; height, floor to ram, 40½ in.; power down feed, 6¼ in.; size of box table, 12 x 14 in.; largest cone step, 12 in.; width of drive belt, 3 in.; r.p.m. of countershaft, 290; changes of speed, 8; size of shipping case, 44 x 61 x 68 in.; floor space, 43 x 72 in.



Gage, "Ampeco" Cylinder

American Machine Products Co., Marshalltown, Iowa.

"American Machinist," Feb. 12, 1920

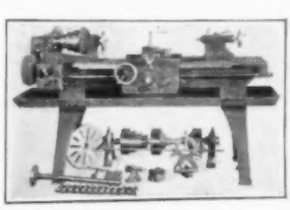
Intended as a substitute for the inside micrometer. When measuring it is merely a matter of finding one of the nine blades to fit the bore and then reading the size that is stamped on that blade. The blade to be used is set at right angles to the others and the cylinder size is determined in the same manner as when calipering. The blades are hardened and ground and the ends ground to a true circle.

Lathe, Quick-Change Engine

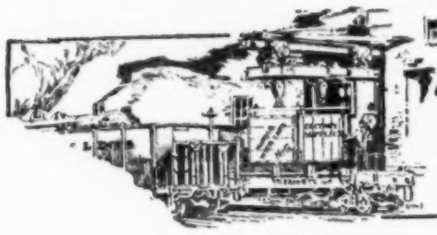
Worcester Lathe Co., 100 Beacon St., Worcester, Mass.

"American Machinist," Feb. 19, 1920

Lathe is of small size and provides for twenty-four changes of threads and feeds. The standard arrangement of gears furnished will cut all threads from 4 to 30 per inch, except 29, and, in addition, several fractional threads such as 4½, 5½, 6½ and 7½ per inch. Four extra gears are furnished to cut various other threads ranging between 32 and 60 per inch. These gears are also used to cut 3, 11½ and 27 threads per inch. Special transposing gears can be furnished for cutting metric and other threads as required. They can be changed readily, when it is necessary to set up a different combination. The gears that are subject to the most wear are made from heat-treated steel.



Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$44.60	$39.10
Northern Basic	42.80	38.20
Southern Ohio No. 2	43.80	40.80
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	47.65	45.65
Southern No. 2 (Silicon 2.25 to 2.75)	47.70	43.20
BIRMINGHAM		
No. 2 Foundry	41.00	35.50
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25 2.75 sil.	45.35 45.65*	42.50*
Virginia No. 2	43.25*	40.00*
Basic	43.00†	40.00†
Grey Forge	42.50*	39.50*
CHICAGO		
No. 2 Foundry local	43.25	40.00
No. 2 Foundry, Southern	46.60	40.50
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	43.65	39.40
Basic	42.90	36.40
Bessemer	43.40	37.40
MONTREAL		
Silicon 2.25 to 2.75%	43.25	

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.97	$3.47	$4.07	$3.62–4.62	$3.97	$3.47	$4.07
Soft steel bars	4.12	3.52	3.97	3.52	4.07	3.52	3.97
Soft steel bar shapes	4.12	3.52	3.97	3.57–3.82	4.07	3.52	3.97
Soft steel bands	4.82	4.22	4.57	5.25			
Plates, ¼ to 1 in. thick	4.17	3.67	4.27	5.00	4.47	3.67	4.27

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.00	$3.50
Warehouse, New York	3.52	4.75
Warehouse, Cleveland	3.42	3.90
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55–4.00	5.57 7.00	5.17	5.35	5.27
No. 12	3.60	5.62 7.10	5.22	5.40	5.32
No. 14	3.65–4.10	5.67	5.27	5.45	5.37
No. 16	3.75–4.20	5.77	5.37	5.55	5.47
Black					
Nos. 18 and 20	4.15–4.65	6.80–7.30	6.02	5.95	6.30
Nos. 22 and 24	4.20–4.70	6.85–7.35	6.07	6.00	6.35
No. 26	4.25–4.75	6.90 7.90	6.12	6.05	6.40
No. 28	4.35–4.85	7.00–8.00	6.22	6.15	6.50
Galvanized					
No. 10	4.70	6.90	8.22	5.05	6.65
No. 12	4.80	6.95	8.27	5.10	6.70
No. 14	4.80	7.10	8.42	5.25	6.85
Nos. 18 and 20	5.10	7.40	8.72	5.55	7.15
Nos. 22 and 24	5.25–5.75	7.80	7.12	6.95	7.55
No. 26	5.40–5.90	7.95	7.27	7.40	7.70
No. 28	5.70–6.20	8.25–9.00	7.57	7.50	8.00

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.50	$5.40	$6.00
Flats, square and hexagons, per 100 lb. base	6.00	5.90	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	55
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00–26.00	$25.50–30.00
Cleveland	20.00	20.00
Chicago	16.50	16.50

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
1/16, 11/64, 3/32, 1/8, 11/64, 3/16, No. 8, 7/32 and No. 10, 1/4, No. 12, 9/32, No. 14 and 5/16, No. 18, No. 20	21.00 to 30.00	3/16 by 12 in. long	14.00
		1/4 by 19 in. long	12.00
		5/16 by 19 in. long	10.00
		3/8 by 21 in. long	10.00
		Special Welding Wire, Coated	
		1/8	33.00
		5/32	30.00
		1/4	38.00

Domestic 20c. for 1/16, 15c. for 1/8 to 1/16

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	10.00	11.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	5.50	4.32
Cold-rolled strip steel	10.00	8.25	8.00
Floor plates	6.55	6.00	6.27

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
1/8, 1/4 and 3/8	50½%	24%			
1/2	54½%	40%			
3/4	57½%	44%			
1 to 3			3/8 to 1 1/4	30%	23½%

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

1/8, 1/4 and 3/8	46½%	29%	3/8 to 1/2	39½%	24½%
1/2	51½%	39%			
3/4 to 1 1/4	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4		23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Stock discounts in cities named are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1/8 to 3 in. steel butt welded	40%	24%	40%	31%	57½%	44%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	53½%	41%

Malleable fittings, Class B and C, banded, from New York stock sell at plus 22½%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.00	19.50	17.50
Tin in 5-ton lots	60.00	63.00	72.50
Lead	9.00	9.00	5.10
Spelter	9.50	9.875	6.50
ST. LOUIS			
Lead	8.375	8.375	4.80
Spelter	9.225	9.225	6.50

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

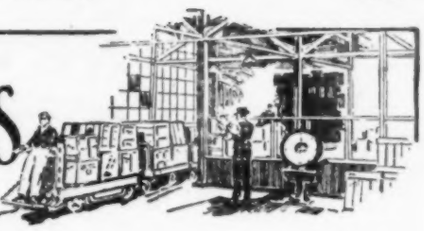
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	29.50	29.00	24.50	31@32	30.00	36.00	32.00
Copper wire (carload lots)	29.25	29.25	25.00	29.50	32.00	27.00	28.50
Brass sheets	26.50	26.50	23.75	29.00	32.00	27.00	29.00
Brass pipe	32.00	32.00	34.00	34.00	36.00	35.00	37.00
Solder (half and half) (case lots)	39.00	39.00	38.00	40.50	41.50	38.00	39.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	20.50
New York	23.75	21.50
Cleveland	29.00	27.00
Chicago	26.00	28.50

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:
Carload lots f.o.b. mill 12.00

	—In Casks— Current	One Year Ago	— Broken Lots — Current	One Year Ago
Cleveland	15.00	18.75	15.50	18.40
New York	14.00	13.00	14.50	15.50
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	11.25	7.53
Chicago	12.50	8.50
Cleveland	13.00	10.50

OLD METALS—The following are dealers' purchasing prices in cents per pound:

	— New York — Current	One Year Ago	—Cleveland— Current	One Year Ago	Chicago
Copper, heavy, and crucible	16.50–17.00	15.00	17.50	15.00	17.00
Copper, heavy, and wire	16.00 16.50	14.00	17.00	14.00	16.25
Copper, light, and bottoms	15.00 15.50	12.00	15.50	12.00	15.00
Lead, heavy	6.75 7.00	4.00	7.50	4.00	7.50
Lead, tea	6.00 6.25	3.00	5.00	3.00	6.00
Brass, heavy	11.50 12.00	8.75	14.00	9.00	16.25
Brass, light	9.00 9.50	7.00	10.50	7.00	10.00
No. 1 yellow brass turnings	9.50 10.00	9.50	11.00	7.00	11.00
Zinc	6.00 6.25	5.00	6.00	3.50	7.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb.	33.00	34.00c.@35.00c	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	33.00	27.00
Chicago	29.00	38.00
Cleveland	32.00	29.00–33.00

BABBITT METAL—Warehouse price per pound:

	—New York— Current	One Year Ago	—Cleveland— Current	One Year Ago	— Chicago — Current	One Year Ago
Best grade	90.00	87.00	70.00	80.00	70.00	75.00
Commercial	50.00	42.00	20.00	18.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York — Current	One Year Ago	— Cleveland — Current	One Year Ago	— Chicago — Current	One Year Ago
Hot pressed square	+$2.00	.80	$1.00	$1.25	$1.25	.98
Hot pressed hexagon	+ 2.00	.80	1.00	1.10	1.25	.78
Cold punched hexagon	+ 2.00	2.50	1.00	1.00	.90	1.00
Cold punched square	+ 2.00	2.50	1.00	1.00	.90	1.00

Semi-finished nuts, ⅜ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	60%	50–10%
Chicago	50%	50%
Cleveland	60–10%	60%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	25%	50%	35–5%
Larger and longer up to 1¼ in. by 30 in.	15%	40%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:
For wrought-iron washers:
New York..... $1.50 Cleveland..... $4.50 Chicago..... $3.00
For cast-iron washers the base price per 100 lb. is as follows:
New York..... $7.00 Cleveland..... $3.75 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	15%	40–5%	30%
Larger and longer up to 1 in. by 30 in.	5%	37½%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets Current	One Year Ago	Burs Current	One Year Ago
Cleveland	20%	List	30%	List
Chicago	10%	List	10%	List plus 20%
New York	10%	30% from list	10%	10% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅛ and smaller	30%	55% off	45%
Tinned	30%	55% off	45%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:
New York...$6.00 Cleveland...$4.00 Chicago....$4.97 Pittsburgh...$4.72
Structural, same sizes:
New York...$6.10 Cleveland...$4.10 Chicago....$5.07 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	33.50	36.00	35.00
Brass	32.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb. advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb. 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00–13.00	16.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.25	4.25	3.62
Chicago	5.00	5.00	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Feb. 19	Feb. 12	Feb. 5	Jan. 29
Prompt furnace	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

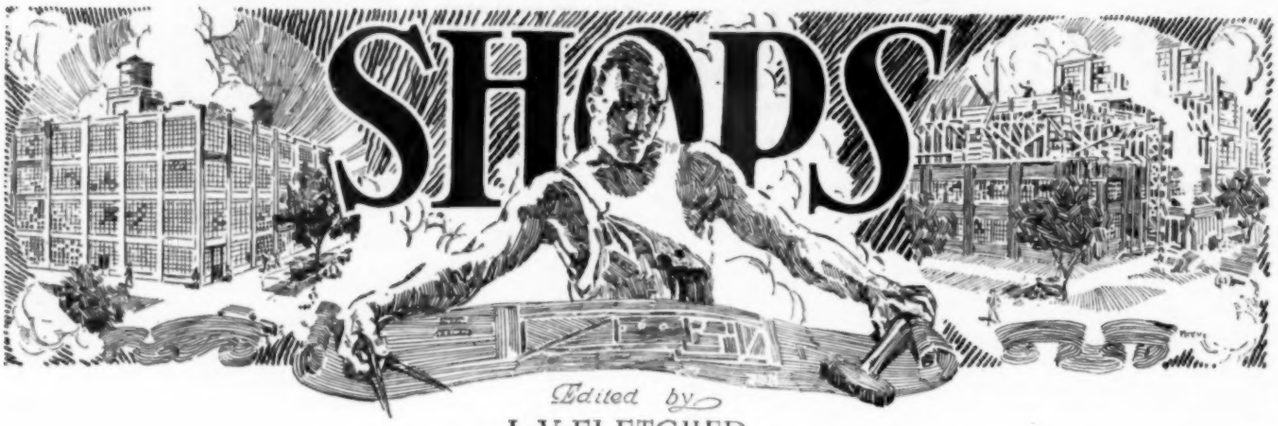
	— New York — Current	One Year Ago	— Chicago — Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.80	$1.50	$1.98	$1.66
5-gal. cans	2.00	1.65	2.23	1.86

WHITE AND RED LEAD—Base price per pound:

	Red — Current Dry	In Oil	One Year Ago Dry	In Oil	White — Current Dry and In Oil	One Year Ago Dry and In Oil
100 lb. keg	15.00	16.50	13.00	14.50	15.00	13.00
25 and 50-lb. kegs	15.25	16.75	13.25	14.75	15.25	13.25
12½-lb. keg	15.50	17.00	13.50	15.00	15.50	13.50
5-lb. cans	17.00	18.50	15.00	16.50	17.00	15.00
1-lb. cans	18.00	19.50	16.00	17.50	18.00	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

NEW *and* ENLARGED



Edited by
L·V·FLETCHER

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools.

D. C., Washington—A. L. Flint, Purchasing Agent for the Panama Canal, Washington—miscellaneous hand tools.

Md., Baltimore—The Hess Steel Corp., Biddle St. and Loney's Lane—14 in. rolling mill.

Md., Baltimore—The Marine Eng. Corp., 110 East Lexington St.—marine repairing machine tools.

Md., Baltimore—The O. D. Pruden Corp., Warner and Dock Sts.—machine tools.

Md., Baltimore—The Union Shipbuilding Co., Fairfield—general machine tools.

N. J., Atlantic City—The Packard Motor Co.—garage equipment.

N. J., Trenton—The J. Stokes Rubber Co., Taylor St.—rubber making machinery.

N. Y., Avon — The G. J. Gillies Co., Rochester—box making machinery for factory, here.

N. Y., Binghamton—Bd. Educ., D. J. Kelley, Supt.—miller, turret lathe, small lathes, emery grinders, drill presses, universal grinder, planers, chucks and hand tools.

N. Y., Buffalo—The H. G. Tront Co., 226 Ohio St.—machine shop tools.

N. Y., Cortland—The Shartz Newton Woolen Co.—textile machinery.

N. Y., Gouverneur—M. E. Curtis—lathe, drill press and miller.

N. Y., Little Falls—The A. F. Kingston Last Mfg. Co., Inc.—foundry equipment and machine tools.

N. Y., New York—(Borough of Manhattan)—Winsor & Newton, 31 East 17th St.—crushers for vegetable oils.

N. Y., Potsdam—A. Ditano—concrete block presses and molds.

N. Y., Rochester—A. H. Boyce, 160 East Ave.—machine tools for repair work.

N. Y., Seneca Falls—The Radder Vending Machine Co., Inc.—small lathes, millers and drill presses.

N. Y., Syracuse—The Crouse-Hinds Co., Wolf and 7th Sts.—heavy lathe and a 14 or 16 in drill press.

N. Y., Syracuse—The Dyneto Electric Corp., Wolf and Park Sts., L. Kuntz, Pur. Agt.—mill end cutters, reamers, sockets, drills, counter sinks and taps.

N. Y., Syracuse—The H. H. Franklin Mfg. Co., 302 South Geddes St.—one 30 in. King boring mill and one 2 spindle gear roughing shaper.

N. Y., Syracuse—The Syracuse Washer Corp., 507 East Water St.—screw machines, lathes, boring drills, multiple drills and grinders.

N. Y., Syracuse—Tompkins Bros., 583 South Clinton St.—two 30 in. lathes and knitting machinery.

N. Y., Syracuse—The Vulcan Die Casting Co.—one No. 2 Foster screw machine.

N. Y., Watertown—The Biche-Gardiner Motor Co., 117 Stone St.—miller and a small drill and arbor press.

N. Y., Watertown—The New York Air Brake Co., Starbuck Ave.—equipment for the manufacture of the "Three Point Truck" and a pleasure car to be equipped with the "Deppe Superheater."

Pa., Du Bois—The Vulcan Soot Cleaner Co., East Long Ave.—power rip saw, to cut 3 or 4 in. timber, 1 shaper and 1 horizontal miller.

Pa., Fernwood—W. Lupkin, 1208 Arch St., Philadelphia—garage equipment.

Pa., Philadelphia—J. Cohen, 1204 North 8th St.—garage equipment.

Pa., Philadelphia—The Midvale Steel Co., Weidner Bldg—gantry crane, 10 ton capacity (used).

Pa., Philadelphia—The Pennsylvania R. R., Bell Bldg., 17th and Filberts Sts.—lathes, grinders, shapers, portable lathes and planers.

Pa., Wilkes-Barre—The Vulcan Iron Wks., Main St.—1 outside overhead electric traveling crane and 2 inside overhead electric traveling cranes, each 15 ton capacity.

Ga., Atlanta—The J. M. Karwisch Wagon Wks., 81 East Hunter St.—machinery for the manufacture of wood and metal automobile truck bodies.

Ky., Louisville—H. J. Broyles, 931 Samuel St.—12 or 14 in. lathe, a 20 in. drill press and a sensitive drill (used).

N. C., Wilmington—The Wilmington Iron Wks., Inc., Orange St.—one 26 to 30 in. with 14 to 18 ft. bed, and one 18 to 24 in. with 12 to 14 ft. bed, high speed, heavy duty, belt driven with taper attachments engine lathe.

Va., Norfolk—The Norfolk Shipbuilding Corp., 526 Argyle Ave.—machine shop equipment and woodworking machinery.

Ill., Chicago—The Stewart Warner Speedometer Co., 13128 Michigan Ave.—power presses.

Ind., Michigan City—The Haskell Baker Car Co.—engine and turret lathes also planers.

Mich., Bay City—The Union Motor Truck Co., 1112 North Water St.—turret lathes, planers, and general automatic equipment.

Mich., Bay City—The Wilson Body Co.—woodworking machinery.

Mich., Belding—The Jacquette Motor Corp.—power presses, lathes and millers.

Mich., Detroit—The Cadillac Metal Parts Co., 1343 Cass St.—machinery for the manufacture of tanks, hoods and fenders.

Mich., Detroit—The Lincoln Motor Co., Fireman Ave.—general machine tools.

Mich., Detroit—The Monarch Foundry Co., 895 Greenwood Ave.—blower, conveyor, rattlers, etc.

Mich., Detroit—The Pharo Mfg. Co., 1336 Woodward Ave.—automatic screw machines.

Mich., Detroit—The Sewell Cushion Wheel Co., 1296 Gratiot Ave.—dry kiln equipment.

Mich., Evart—The American Logging Tool Co.—punch press or a punch and shear with capacity of ¾ in. hole in ¾ in. stock (new).

Mich., Flint—The Dort Motor Car Co., South St.—racks and small machine tools.

Mich., Jackson—The Marshall Automobile Co., 125 East 3rd St.—small tools and repair shop equipment.

Mich., Niles — The Wilson Mfg. Co.—slitting press for metal lathe stock.

Mich., Rochester—The Rochester Machine and Foundry Co.—foundry equipment, including a blower and crane.

O., Cincinnati—The MacLeod Co., Bogen St.—5 ton traveling crane.

O., Cleveland—The Champion Machine Forge Co., East 71st St. and Union Ave.—6 power hammers.

O., Cleveland—The Fisher Body Co., Oakland and Piquette Aves.—complete equipment for the manufacture of automobile bodies.

O., Cleveland—The Nickel Plate Co., Columbia Bldg.—general shop equipment. Estimated cost, $100,000.

O., Cleveland—The Perfection Rubber Co., 2097 Columbus Rd.—rubber mold machinery.

O., Columbus—The Columbus Bolt Works Co., 160 West Randolph St.—two ¾ or 1 in. Landis double head or single head bolt cutters or threading machines, one ½ in. No. 3 open die triple stroke header. (used.)

O., Columbus—The Lowe Bros., Machine and Engine Wks. Co., 200 West Mount St.—48 in. lathe (used).

O., East Palestine—The Efficiency Electric Co., Park Ave.—punch presses, drill presses, engine lathes, riveting machines, shapers, power shears and electric welders (new).

O., Lorain—The Hoffman Heater Co.—Eynon & Ingersoll plane miller, 24 in. engine lathe with 30 in. swing; also 30 and 40 in. Niagara shears.

O., Mansfield—The Bodine Roofing Co.—milk bottle cap machinery.

O., North Canton—The Hoover Suction Sweeper Co.—nut tapping machine, to make ¼ in. threads.

O., Warren—W. D. Hart, 205 Parkman St.—shaper, miller, lathes, grinder and hand tools.

Wis., Merton—C. Ottesen—20 in. band saw.

Wis., Milwaukee—G. Bernert, 759 33rd St.—power drills.

Wis., Milwaukee—W. H. Devos & Co., 32nd and Concordia Sts.—cement block making machinery.

Wis., Milwaukee—The Dunning Heating Supply Co., 223 Reed St.—sheet metal working machinery.

Wis., Milwaukee—The Lawson Airline Transportation Co., 425 East Water St.—drill presses, lathes, and welding machinery.

Wis., Milwaukee—The Milwaukee Electric Railway and Light Co., Public Service Bldg.—heavy duty lathes and drill presses.

Wis., Milwaukee—The Milwaukee Tank Wks., Fratney and Becker Sts.—16 in. engine lathe, drill presses and a radial drill.

Wis., Milwaukee—A. J. Pietsch, 539 31st St.—woodworking machinery.

Wis., Milwaukee—The Richards Machine Co., 3417 Vliet St.—general machine tools.

Wis., Milwaukee—The E. R. Wagner Co., North Milwaukee—power presses.

Wis., Milwaukee—The West Side Buick Co., 2713 Grand Ave.—one 18 in. lathe and one drill press.

Wis., Milwaukee—The Wisconsin State Rubber Co., 181 4th St.—vulcanizing machinery.

Wis., Saukville — H. T. Cary, canning machinery.

Wis., South Milwaukee—C. P. Nourse, c/o Stowell Co.—plating machinery and japaning ovens.

Wis., Tomahawk—The Tomahawk Toy Co.—machinery for the manufacture of wooden toys.

Kan., Independence — The McElvaine Mfg. Co., Box 503—No. 3 pipe machine and a radial drill (new).

Kan., Norton—The Norton Mfg. Co.—several upright drill presses, 20 in. swing, self-fed, with or without back gears (used).

Minn., Maples—The Hudson Mfg. Co.—power presses (used).

Minn., Minneapolis—The W. S. Nott Co., 2nd Ave. N., and 3rd St.—plain power press (new or used).

Minn., St. Cloud—The Pandoefo Mfg. Co. —general machine tools.

Mo., St. Louis—The Guaranteed Battery Co.—screw press for battery plates.

Mo., St. Louis—The St. Louis Tin and Sheet Metal Working Co., 6th St. and Clark Ave.—sheet metal working machinery

Mo., St. Louis—The Western Tinware Co., 1308 North 16th St.—machinery for the manufacture of electric washing machines.

Tex., Houston—The Southern Motors Mfg. Association, Beatty Bldg.—machines for the manufacture of automobiles.

Tex., Sweetwater—The Armstrong Farm Tractor Co.—general machine tool equipment.

Ore., Albany—J. P. Van Orsdel—new lumber machinery, including saws, planer, etc.

Wash., Vancouver—The Columbia Dairy Products Co.—pasteurizing and condensing equipment.

Ont., Brantford—The Blue Bird Co.—medium sized blanking and drawing presses, hand millers, gang drills, electric spot and acetylene welding equipment, broaching and gear cutting machines and general machine shop tools.

Ont., Toronto—The Keystone Products Co., Ltd., 133 Eastern Ave.—two 1,000 lb., two 1,500 lb. and one 5,000 lb. drop forging hammers.

Ont., Toronto—The A. R. Williams Machinery Co., Ltd., 64 Front St.—35 ft. boring mill and a guillotine shear to cut 2 in. rounds (new).

Ont., Walkerville—The Kales Stamping Co.—sheet metal working machinery.

Metal Working

NEW ENGLAND STATES

Conn., Bridgeport—The F. L. Mills Co., 617 State St., is having plans prepared by Fletcher-Thompson, Inc., Engrs., 1089 Broad St., for the construction of a 2 story, 100 x 150 ft. service station, on Fairfield Ave. Estimated cost, $100,000.

Mass., East Springfield—The Westinghouse Electric Co., 6905 Susquehanna St., Pittsburgh, Pa., will soon award the contract for the construction of a 1 story machine shop. Estimated cost, $360,000.

Mass., Robert's Crossing (Boston P. O.) —The W. C. Welch Co. has awarded the contract for the construction of a 2 story, 40 x 100 ft. factory, a boiler house, fire room and garage.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Backus Motor Sales Co., 10 East North Ave., has awarded the contract for the construction of a 1 story, 100 x 100 ft. addition to its garage. Estimated cost, $25,000.

Md., Baltimore—E. Blum, Equitable Bldg., has awarded the contract for the construction of a 1 story, 60 x 100 ft. garage and salesroom, on Preston St. near Guilford Ave. Estimated cost, $20,000.

Md., Baltimore—The Marine Eng. Corp., 110 East Lexington St., has awarded the contract for the construction of a 1 story, 60 x 110 ft. machine shop on Atlantic wharf, foot of Lakewood Ave. Estimated cost, $12,000.

N. J., Atlantic City—The Packard Motor Co. will build a 1 story, 95 x 218 ft. service station, on Ventnon and Boston Sts. P. S. Tyre, 1509 Arch St., Philadelphia, Archt.

N. J. Jersey City—The Continental Can Co. is having plans prepared by Francisco & Jacobus, Engrs., 511 5th Ave., New York City, for the construction of a 4 story factory, at 15-16 Cole and Monmouth Sts. Estimated cost, $750,000.

N. J., Trenton—The Fitzgibbon & Crisp Co., Calhoun St., has awarded the contract for the construction of a 1 story, 60 x 150 ft. addition to its plant, for the manufacture of automobile bodies. Estimated cost, $18,000.

N. J., Trenton—The Mercer Motor Co., Whitehead's Rd., has awarded the contract for the construction of a 1 and 2 story, 40 x 73 ft. and 80 x 400 ft. paint shop. Estimated cost, $200,000.

N. Y., Albany—The Allen & Arnink Garage Co., Hudson Ave., plans to build a 2 story, 37 x 70 ft. addition to its garage. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn) —H. Figge, 285 Atlantic Ave., is having plans prepared by J. Cherry, Archt., Grand Central Terminal, 42nd St., New York City, for the construction of a 4 story garage, on Pacific St. Estimated cost, $60,000.

N. Y., New York (Borough of Brooklyn) —W. P. Jones, c/o Parfitt Bros., Archts., 26 Court St., will build a 2 story addition to its garage, at 241 Waverly Ave.

N. Y., New York (Borough of Brooklyn) —The Kop Spear Device Co., 330 Utica Ave., will build two 1 story, 50 x 100 ft. shops, on Van Sinderen Ave. Estimated cost, $25,000. A. Koppell, Pres.

N. Y., New York (Borough of Brooklyn) —The Lind-Leff Realty Corp., 1592 Eastern Parkway, will build a 1 story, 85 x 100 ft. garage, at 119 Lexington Ave. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn) —Schwartzbach & Sterallo, 2 Park Ave., have awarded the contract for the construction of a 2 story, 60 x 100 ft. garage and factory, on Tillery and Navy Sts. Estimated cost, $65,000.

N. Y., New York (Borough of Brooklyn) —The Talsbonsore Realty Corp., 1404 Eastern Parkway, will build a 1 story, 50 x 60 x 70 x 107 x 150 ft. garage, on Adams St. Estimated cost, $40,000. Also a 1 story, 100 x 100 ft. garage, on Warren St. and 4th Ave. Estimated cost, $25,000.

N. Y., Rochester—A. H. Boyce, 160 East Ave., plans to build a 2 story, 64 x 195 ft. salesroom, garage and machine shop. Estimated cost, $40,000.

N. Y., Rochester—The Selden Motor Co., Probert St., plans to build a 2 story, 100 x 140 ft. addition to its present plant. Estimated cost, $58,000.

N. Y., Rochester—The Starter & Ignition Service Co., 437 Main St., E., plans to build a 1 and 2 story, 53 x 150 ft. plant. Estimated cost, $30,000.

N. Y., Syracuse—The Oberdorfer Brass Co., Water St., plans to build a 1 story, 280 x 440 ft. factory, for the manufacture of automobile castings, at Messina Springs. Estimated cost, $350,000. M. L. King, Snow Bldg., Archt.

N. Y., Syracuse—The Syracuse Garage Co., 647 South Warren St., will build a 2 story, 77 x 132 ft. garage. Estimated cost, $35,000.

Pa., Fernwood—W. Lupkin, 1208 Arch St., Philadelphia, plans to build a 1 story garage, here. Estimated cost, $25,000. J. T. Hochstra, 1713 Sansom St., Philadelphia, Archt.

Pa., Holmesburg—The Bessemer Motor Truck Co. has awarded the contract for the construction of a 1 and 2 story, 40 x 90 x 400 ft. factory. L. B. Rothchild, 1225 Sansom St., Philadelphia, Archt. Noted Jan. 15.

Pa., Philadelphia—The Apperson Motor Car Co., Broad and Race Sts., is having plans prepared by E. H. Yardley, Archt., 1713 Sansom St., for the construction of a 6 story, 75 x 100 ft. sales and service station, on Girard and Broad Sts.

Pa., Philadelphia—J. Cohen, 1204 North 8th St., is having plans prepared by L. W. Levin, Archt., 536 Ritner St., for the construction of a 2 story, 38 x 110 ft. garage. Estimated cost, $20,000.

Pa., Philadelphia—C. Kahn, Morris Bldg., has awarded the contract for the construction of a 2 story, 25 x 150 ft. addition to its sales and service station, at 1419 North Broad St. Estimated cost, $50,000.

Pa., Philadelphia—L. J. Kolb, West School Lane, Germantown, will soon award the contract for the construction of a 1 and 2 story, 40 x 160 ft. and 25 x 160 ft. sales and service station, at 901 North Broad St. Estimated cost, $50,000. H. B. Weldon, Fuller Bldg., Archt.

Pa., Philadelphia—H. Weinreich, c/o Greisler & Abransom, Archts., Lafayette Bldg., has awarded the contract for the construction of a 1 story, 60 x 200 ft. garage, on 3rd and Cambridge Sts. Estimated cost, $20,000.

SOUTHERN STATES

S. D., Ispwich—Bd. Educ. will soon award the contract for the construction of a 2 story, 75 x 120 ft. grade and high school, to include an auditorium, gymnasium, domestic science room and a manual training hall. Estimated cost, $100,000. Edwins & Edwins, 911 Northwestern Bank Bldg., Minneapolis, Minn., Archts. J. Owens, Clk.

Tenn., Knoxville—V. H. McLean plans to build a 3 story, 100 x 135 ft. garage. Estimated cost, $100,000.

Va., Danville—The Crowell Auto Co., 542 Craghead St., has awarded the contract for the construction of a 2 story, 110 x 176 ft. garage. Estimated cost, $100,000.

MIDDLE WEST

Ill., Chicago—W. Browar, c/o A. L. Levy, Archt., 111 West Washington St., will soon award the contract for the construction of a 1 story, 75 x 150 ft. garage, on Van Buren and Loonia Sts. Estimated cost, $30,000.

Ill., Chicago—C. Lange & Bros. Co., 2740 Armitage Ave., has awarded the contract for the construction of a 4 story, 75 x 125 ft. automobile sales and service station, on Milwaukee and Kedzie Aves. Estimated cost, $135,000.

Ill., Chicago—A. Plamondon Mfg. Co., 24 North Clinton St., has awarded the contract for the construction of a 1 story, 100 x 500 ft. factory, on 52nd St. and Western Ave., for the manufacture of machine shop and foundry machinery. Estimated cost, $250,000.

Ind., Indianapolis—The F. Hatfield Co. 535 North Capitol Ave., has awarded the contract for the construction of a 3 story, 84 x 195 ft. garage and salesroom, on Capitol Ave. and Emmet St. Estimated cost, $150,000.

Ind., Indianapolis—The Indiana Motors Co., 425 North Meridian St., plans to build a 4 story, 120 x 200 ft. automobile sales and service station, at 1135-41 North Meridian St. Estimated cost, $125,000. J. L. Baugh, Mgr.

Ind., Indianapolis—The Reedy Elevator Co., 1026-42 Kentucky Ave., plans to build a 1 story, 44 x 200 ft. factory, on South New Jersey St., between Merrill and South Sts. Estimated cost, $25,000. D. V. Reedy, Pres.

Mich., Bay City—The Wilson Body Co. will soon award the contract for the construction of a 3 story, 250 x 350 ft. addition to its automobile body factory. Estimated cost, $500,000. Esselstyn, Murphy & Hanford, 810 Marquette Bldg., Detroit, Engrs., A. E. Munger, 420 Shearer Bldg., Archt.

Mich., Detroit—The Monarch Foundry Co., 895 Greenwood Ave., has awarded the contract for the construction of a 1 story, 100 x 200 ft. foundry, on Herrick St. Estimated cost, $75,000.

Mich., Detroit—The Sewell Cushion Wheel Co., 1296 Gratiot Ave., will build a 2 story, 60 x 20 ft. dry kiln, on Harper Ave. Estimated cost, $40,000.

Mich., Flint—The Dort Motor Car Co., South St., has had plans prepared by Smith, Hinchman & Grylls, Engrs. and Archts., 710 Washington Arcade, Detroit, for the construction of a 1 story, 41 x 168 ft. factory. Estimated cost, $20,000.

Mich., Jackson—The Marshall Automobile Co., 125 East 3rd St., plans to build a 2 story, 50 x 183 ft. garage. Estimated cost, $50,000. G. H. Swift, 105 Armory Block, Flint, Archt. Estimated cost, $50,000.

Mich., Rochester—The Rochester Machine and Foundry Co. is having plans prepared by C. Roland Gles, Archt., 701 David Whitney Bldg., Detroit, for the construction of a 1 story, 60 x 128 ft. foundry. Estimated cost, $20,000.

O., Cincinnati—The MacLeod Co., Bogen St., machine specialists, plans to build a 3 story, 28 x 60 ft. factory. Stewart & Stewart, 519 Main St., Archts.

O., Cleveland—The Auer Register Co., Long Ave., has awarded the contract for the construction of a 2 story, 75 x 100 ft. factory, on Payne Ave. and East 37th St. Estimated cost, $75,000. Noted Feb. 19.

O., Cleveland—The Fisher Body Co., Oakland and Piquette Aves., Detroit, Mich., plans to build a 6 story, 120 x 1,300 ft. automobile body factory, on Coit Rd., here. A. Kahn, Marquette Bldg., Detroit, Mich., Archt.

General Manufacturing

MIDDLE ATLANTIC STATES

N. J., Trenton—The J. Stokes Rubber Co., Taylor St., has awarded the contract for the construction of a 2 story, 70 x 100 ft. factory. Estimated cost, $35,000.

N. J., Union Hill (Weehawken P. O.)—The Hasco Textile Co. will build a 2 story factory, for the manufacture of silk, on Franklin St. Estimated cost, $60,000.

N. Y., Avon—The G. J. Gillies Co., Rochester, manufacturer of paper boxes, plans to build a 2 story, 50 x 150 ft. factory here. Estimated cost, between $40,000 and $50,000.

N. Y., Buffalo—The Dunlap Rubber Co., 1808 Broadway, New York City, has awarded the contract for the construction of a plant, to consist of twelve 1 and 2 story buildings, here. Estimated cost, $20,000,000.

N. Y., New York (Borough of Brooklyn)—The Empire Biscuit Co., 30 Waverly Ave., will build a 4 story, 50 x 100 ft. factory, at 28 Waverly Ave. Estimated cost, $100,000. Dodge & Morrison, 135 Front St., New York City, Archts.

N. Y., New York (Borough of Brooklyn)—J. Rubin & Son, 142 Greene Ave., will build a 3 story, 100 x 100 ft. factory, for the manufacture of paper boxes, on Grand and Park Aves. Estimated cost, $50,000.

N. Y., Rochester—The Alderman-Fairchild Co., 367 Orchard St., manufacturer of paper boxes, has increased its capital from $25,000 to $750,000 and plans to build an addition to its plant. Estimated cost, between $50,000 and $60,000.

N. Y. Rochester—The H. Connolly Co., printers, plans to build a 2 story, 40 x 100 ft. addition to its present plant, at 43 Elizabeth St.

N. Y., Tuckahoe—The Hodgman Rubber Co. will soon award the contract for the construction of a 5 story, 60 x 150 ft. addition to its factory. Estimated cost, $200,000. W. L. Stoddard, 9 East 40th St., New York City, Archt.

N. Y., Woodhaven—The Merritt Hosiery Co., c/o Block & Hesse, Engrs., 18 East 41st St., New York City, will soon award the contract for the construction of a 4 story, 60 x 180 ft. factory, on 104th St.

MIDDLE WEST

Ill., Chicago—The Fergeson Lander Co., 418 South Clinton Ave., will soon award the contract for the construction of a 2 story, 50 x 150 ft. paper box factory, on Austin and Hermitage Aves. Estimated cost, $50,000. J. P. Cowing, 30 North La Salle St., Engr.

Ill., Chicago—The Kroeck Paper Box Co., 220 Institute Pl., will soon award the contract for the construction of a 3 story, 120 x 140 ft. factory, at 1701 West Superior St. Estimated cost, $175,000. H. C. Miller, 112 West Adams St., Archt.

Ind., Indianapolis—The U. S. Corrugated Fiber Box Co. has awarded the contract for the construction of a 3 story, 100 x 160 ft. factory, on Roosevelt and Martindale Aves. Estimated cost, $125,000.

Mich., Detroit—The Braun Lumber Co., Davison Ave., plans to build a 1 story factory, on Davison Ave. along the Grand Trunk Ry., for the manufacture of lumber products and interior finish. Estimated cost, $75,000.

Mich., Grand Rapids—The Toledo Plate & Window Glass Co., 19 Ottawa Ave., has awarded the contract for the construction of a 2 story, 123 x 130 ft. warehouse, factory and office. Estimated cost, $95,000.

O., Cincinnati—The Billboard Publishing Co., Opera Pl., plans to build a factory, on Giobert Ave. Estimated cost, $250,000.

O., Cleveland—J. Bassiches & Son, Society for Savings Bldg., manufacturer of water bottles, has awarded the contract for the construction of a 1 story, 40 x 120 ft. factory, on East 22nd St. and Orange Ave. Estimated cost, $30,000.

O., Cleveland—The Eilert Beverage Co., 2539 Lorain Ave., will soon award the contract for the construction of a 2 story, 60 x 110 ft. bottling plant, on Sackett Ave. Estimated cost, $50,000. A. C. Bishop, 427 Guardian Bldg., Archt. and Engr.

O., Cleveland—The Friedman Blau Farber Co., East 37th St., and Perkins Ave., manufacturer of knit goods, has awarded the contract for the construction of a 6 story, 57 x 85 x 127 ft. addition to its factory. Estimated cost, $200,000. H. Friedman, Pres.

O., Cleveland—The Green-Haas-Schwartz Co., 1967 East 57th St., will soon award the contract for the construction of a 3 story, 164 x 290 ft. factory, for the manufacture of knit goods, on East 105th St. and Elk Ave. Estimated cost, $400,000. Christian, Schwarzenberg & Gaede, 1900 Euclid Ave., Archt.

O., Cleveland — The Harshaw-Fuller-Goodwin Co., 1001 Newburg Ave., has awarded the contract for the construction of a 2 story, 30 x 95 ft. addition to its chemical factory. Estimated cost, $25,000.

O., Cleveland—The Ohio Fibre Container Co., 209 Williamson Bldg., plans to build a 2 story addition to its factory, on East 103rd St. and Harvard Ave. Estimated cost, $75,000. D. Jones, Secy.

O., Cleveland—The Penton Publishing Co., 1136 Chestnut Ave., has awarded the contract for the construction of a 9 story, 135 x 135 ft. printing plant, on West 3rd St. and Lakeside Ave. Estimated cost, $700,000.

O., Cleveland—The Perfection Rubber Co., 2097 Columbus Rd., is having plans prepared for the construction of a 2 story, 100 x 110 ft. factory, on Brook Park Rd. Estimated cost, $60,000. L. J. Johnson, Vice Pres.

O., Cleveland—Schaffner Bros., 1013 Oregon Ave., will build a 3 story, 96 x 221 ft. textile factory, on Buckeye Rd. near East 104th St. Estimated cost, $150,000. Christian, Schwarzenberg & Gaede Co., 1900 Euclid Ave., Archt. and Engr.

O., Dayton—The Dayton Rubber Mfg. Co., West River St., plans to build 1 story, 70 x 200 ft. plant for the manufacture of rubber. Estimated cost, $35,000.

O., Dayton—The Master Tire and Rubber Co., 706 Schwind Bldg., plans to build a 6 story, 75 x 130 ft. factory, on Leo St. Estimated cost, $200,000. J. J. Black, Engr.

O., Dayton—The Reed Furniture Co., 111 East 3rd St., has awarded the contract for the construction of a 3 story, 83 x 120 ft. factory, on West 5th St. Estimated cost, $250,000.

O., Dayton—C. F. Sheffer, 221 Northwestern Ave., will soon award the contract for the construction of a 2 story, 70 x 150 ft. dry cleaning plant, on South Main St. Estimated cost, $25,000.

Wis., Milwaukee—The Downing Box Co., 3rd and Vienna Sts., has awarded the contract for the construction of a 1 story, 120 x 300 ft. factory. Noted Jan. 22.

Wis., Milwaukee — The Westinghouse Lamp Co., 165 Broadway, New York City, has awarded the contract for the construction of a 4 story addition to its plant, here. Estimated cost, $400,000.

Wis., Saukville—H. T. Cary plans to build a 2 story, 36 x 376 ft. pea canning factory, on Main St. Estimated cost, $40,000.

Wis., South Milwaukee—The Schartow Mfg. Co., 1221 Frederick Ave., Racine, manufacturer of saddles, etc., has awarded the contract for the construction of a 1 story, 90 x 300 ft. factory. Estimated cost, $60,000.

Wis., Waukesha—The Waukesha Cement Tile Co., 102 Main St., will build a 1 story, 132 x 136 ft. factory. Estimated cost, $45,000.

Wis., Waukesha—The Waukesha Furniture Co., 311 Sherman Ave., Ft. Atkinson, is having plans prepared by J. G. Shodnon, Archt., Ft. Atkinson, for the construction of a 1 story, 150 x 150 ft. factory. Estimated cost, $50,000.

WEST OF THE MISSISSIPPI

Okla., Pawhuska—The Le Flore Oil and Gas Co., Tulsa, plans to build a refinery here. Estimated cost, $300,000.

WESTERN STATES

Cal., Meridian—The Alameda Sugar Co., 310 Sansome St., San Francisco, plans to build a sugar refinery here. Estimated cost, $1,500,000.

Ore., Albany—J. P. Van Orsdel and associates have purchased the holdings of the Albany Lumber Co. and plan to build a 1 story addition to same.

Ore., Sheridan—The Oregon Fruit Growers' Association is preparing preliminary plans for the construction of a 1 story fruit packing plant. Estimated cost, $50,000. J. O. Holt, Pres.

Wash., Seattle—I. Hinckley, 1004 3rd Ave., plans to build a 2 story, 120 x 121 ft. factory for the manufacture of shoes, on Westlake Ave. and Highland Drive. Estimated cost, $40,000. Ivey & Riley, Boston Block, Archts.

Wash., Tacoma—H. G. Senner, c/o Royal Broom Co., has purchased a tract of land on the E. H. Miller site and plans to build a 1 story factory for the manufacture of brooms. Estimated cost, $5,000.

Wash., Vancouver—The Columbia Dairy Products Co. will soon award the contract for the construction of a 2 story, 40 x 80 ft. dairy plant. Estimated cost, $45,000.

CANADA

Ont., Cornwall—The Ives Bedding Co., Ltd., Sydney St., plans to extend its plant.

Ont., Perth—The Perth Shoe Co., Sherbrooke St., plans to build an addition to its plant.

Ont., Toronto—The Canadian Natl. Carbon Co., 265 Adelaide St., W., plans to build a factory for the manufacture of oxygen, tanks and oxygen products. Estimated cost, $100,000. L. McCarthy, Pres.

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